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## THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

### SECTION E—GEOLOGY AND GEOGRAPHY

IN spite of the fact that Section E held a summer field meeting[1] at Plattsburg, N. Y., during the week of July 3 last, the interest of its members in the winter meeting showed no abatement. A large number of its geological members attended the meeting of the Geological Society of America at Albuquerque, and consequently there was not a large attendance of those whose special interest is geology. But, on the other hand, the Association of American Geographers met in Chicago at the same time as Section E, and this attracted a large number of geographers, many of whom are members of the section.

Immediately after the general session of the association, the Association of American Geographers and Section E held a joint meeting for the purpose of arranging the program, after which the two organizations separated. The geological members of the section held six sessions in the Walker Museum, University of Chicago, during Tuesday, Wednesday and Thursday, with the vice-president of the section presiding, and the geographical members met with the American Geographers, except during the early portion of Wednesday afternoon, when the entire section met to listen to Professor Chamberlin's paper on the influence of the tides.

At the first meeting of the section Pro-

[1] An account of the summer meeting is printed in SCIENCE, No. 665, pp. 397–404, Sept. 27, 1907.

fessor W. S. Bayley was elected secretary of the section for the meeting in the absence of the regular secretary, Professor W. H. Hobbs was elected member of the general committee, Professor U. S. Grant, member of the council, and Mr. F. B. Taylor, member of the sectional committee for five years.

At the business meeting of the sectional committee held on Wednesday, January 1, Mr. Bailey Willis, of Washington, was nominated for vice-president of the association and chairman of the section, and Dr. F. P. Gulliver was named for secretary. At this same meeting also the names of about fifteen members were presented to the council with the recommendation that they be elected as fellows. Professor Charles R. Dryer was nominated as delegate from Section E to the Ninth International Geographic Congress, to be held at Geneva in July next.

Since the address of Vice-president Lane had already been read at the summer meeting of the section (Science, August 2, 1907, pp. 129–143) all of the sessions at Chicago were devoted to the presentation and discussion of papers, of which 31 were read in full. The abstracts of these follow:

*The Red Sandstone Series of Southeastern Minnesota:* C. W. Hall, Minneapolis, Minn.

Records of deep and artesian wells drilled in southeastern Minnesota for twenty years past have shown the existence of an apparently widely distributed sandstone beneath the overlying and non-aquiferous beds. Drillings to the granite rocks in several localities indicate a thickness of from 100 feet to 300 feet for this formation, and place it directly upon the basal granite rocks of this region. The paper correlated the scattered data with the view to establishing the existence of a well-defined sandstone series at this horizon.

*Preliminary Account of the Geology of the Highlands of New Jersey:* W. S. Bayley, Urbana, Ill.[2]

The Highlands of New Jersey are a part of the series of ridges of pre-Cambrian rocks that extend southwestward from the Hudson River to Reading in Pennsylvania. They have long been described as being composed of parallel layers of limestone and gneiss, and, principally, because of their association all of the rocks have been regarded as metamorphosed sediments. Recent observations have shown that the limestone is one member of a well-defined series of fragmental rocks of pre-Cambrian age, and that the gneisses are igneous rocks that have intruded these. The parallel arrangement of the rocks is due to the fact that the intrusive rocks invaded the old sedimentary series along their bedding planes. The structure of the gneiss is thought to be the result of flowage, by which some of their components have been strung out in line.

The complex gneisses and sedimentary rocks have been broken into blocks by great longitudinal faults, which almost invariably occur in the southeast sides of the gneiss ridges, separating them from the northwest sides of narrow longitudinal valleys underlain by Paleozoic rocks. One of the largest of these faults limits the Highland area on the south and separates it from the Piedmont plateau. Cross faults of comparatively small magnitude run nearly perpendicularly to the structure of the region and cause slight displacements in the interlaminated gneisses. They are of especial importance in connection with the magnetite mines, since they cause displacements of the ore bodies.

These generally consist of rich magnetic phases of the gneisses and like them are

[2] By permission of the director of the U. S. Geological Survey.

distributed in layers that generally strike and dip with the surrounding rocks.

The sedimentary rocks are correlated with the Grenville series of East Ontario and the Adirondacks.

*Petroleum Fields of Illinois in 1907:* H. FOSTER BAIN, director of the Illinois Geological Survey, Urbana, Ill.

The author declared that in 1907 Illinois will produce more than 24,000,000 barrels of crude petroleum. This is more than any state in the union, save California, produced in 1906 and in fact more than any country, save Russia and the United States. Production began here in June, 1905, with 5,489 barrels. The oil is of good grade, running about 32° Baume. It occurs in Carboniferous strata in Clark, Cumberland, Crawford and Lawrence counties. A number of different producing horizons have been recognized ranging from Upper Coal Measures down to the Chester group of the Mississippian. There is marked irregularity in pressure, in productivity and in relations to gas and salt water in the different pools, and it seems likely that final studies will lead to important conclusions regarding the genesis and accumulation of the oil.

*General Petrology of Wisconsin Igneous Rocks:* S. WEIDMAN, Madison, Wis.

This paper described the general chemical features of a large area of intrusive igneous rocks in central and northern Wisconsin. These were intruded as three separate or distinct magmas, as rhyolite, diorite-gabbro and granite-syenite. Phases of the granite-syenite magma are the highly interesting and rare rocks, nepheline-syenites and associated pegmatites. The several intrusive magmas are each characterized by relatively high alumina and low magnesia. The nepheline-syenites and associated quartz-syenites are especially characterized by high alumina and low magnesia and in them are developed such rare minerals as fayalite and hedenbergite as important rock constituents. Several unusual rock phases are developed. All the igneous rocks of the region show a close chemical relationship, and this close relationship is especially well illustrated in the chemical character of the minerals developed in the syenites and pegmatites.

*Geology and Mining Industry of Chihuahua, Mexico:* RUFUS M. BAGG, Jr., Urbana, Ill.

The author described briefly the main topographic features of the state of Chihuahua and explained their bearing upon the mineralization of the region.

The geologic formations were also discussed and the main types of ore deposits classified. Many examples of mines were cited to illustrate these types. The history of mine development and the future outlook of the mining industry in Chihuahua were discussed in conclusion.

*Niagaran and Oriskanian in the Western Part of Virginia:* E. B. BRANSON, Oberlin, Ohio. (Read by title.)

*The Earthquake of 1872 in the Owens Valley, California:* WILLARD D. JOHNSON, D. C., and W. H. HOBBS, Ann Arbor, Mich. (Read by W. H. Hobbs.)

This paper consisted principally of the description of a series of photographs and specially detailed maps of the country affected by the Owens Valley earthquake. The maps exhibited in an unusually fine manner the courses of recent faults in the valley and their general characteristics.

*A Design for a Universal Seismograph with Duplex Recorders for Horizontal Motion:* C. F. MARVIN, U. S. Weather Bureau, Washington, D. C.

The author described the construction of a single seismograph that will give every

detail of the horizontal components of earthquake motion.

The instrument is capable of producing no less than three distinct records of each component of horizontal motion, making six records in all; that is to say, two components of horizontal motion under high magnification (100 to 200, or more, if necessary); two other records of low magnification (1 to 10, if desired); and finally, during destructive or strongly-felt earthquakes, a low magnification record which will be inscribed on a rapidly-moving drum —thus realizing practically six separate records.

The construction of the instrument was shown by lantern slides.

*Report of Seismological Committee of the International Seismological Association:* H. F. Reid, Baltimore, Md., chairman. (Read by Dr. Otto Klotz, Ottawa, Canada.)

In the absence of Professor H. F. Reid, chairman of the seismological committee, Dr. Otto Klotz, of Canada, who with Dr. Reid attended the meeting of the International Seismological Association at The Hague in September last, read the chairman's report, of which the following is an abstract:

Twenty-two states are now members of the association, England, Austria and Canada having joined since last year. There were about fifty persons present either as delegates or as invited guests, and these included a majority of the leading seismologists of the world. Signor Palazzo, of Italy, was the retiring president. Professor A. Schuster, of Manchester, England, was elected president for the next four years. Professor Forel, of Switzerland, was elected vice-president for two years; and the next meeting of the permanent commission was fixed to take place in Switzerland two years hence; Strassburg was continued as the central bureau of the association for the next four years.

The report of the central bureau showed that it had made careful studies of seismological instruments at Strassburg during the last year, and that it had published the catalog of earthquakes for the year 1904.

In the competition for a cheap seismograph costing 300 Marks, and giving 40 to 50 magnification, instruments were exhibited by Professors Agemennone, Spindler and Boyer, of Göttingen, and Smitt, of Utrecht. They are to be sent to Strassburg and their relative efficiency carefully tested before the prize is awarded.

Many scientific papers were presented at the meeting of the association. Professor Weichert gave his conclusions regarding the character of the interior of the earth based on the result of seismological observations. They confirm his earlier idea of a central core of iron or steel surrounded by a stony layer, and establish the radius of the core at 4,500 kilometers, and the thickness of the stony layer at 1,500 kilometers. The existence of long vibrations of periods of eighteen seconds or more reveals, he thinks, the existence of a layer of liquid or plastic material at a depth of about 30 kilometers from the surface.

Prince Galitzin advocated the use of strong electro-magnetic damping and electro-magnetic recording appliances for seismographs.

*A Reconstruction of the Water Planes of the Extinct Glacial Great Lakes in the Lake Michigan Basin:* J. W. Goldthwait, Evanston, Ill.

In 1905 the writer made numerous measurements of altitude of the raised beaches on the west side of Lake Michigan by the aid of the Wye level. The definite correlation of several shore-lines below the "highest Algonquin" was thus made possible. Last summer similar data were se-

cured, under the direction of F. B. Taylor, on the east side of Lake Michigan, from the Straits of Mackinac southward and on the Upper Peninsula southward to Holland, Mich. From these data several distinct water planes of the extinct lakes, Algonquin and Nipissing, were recognized. They were shown in detail on a plotted profile. The inclined planes converge southward, and appear to coincide near Onekama, Mich., and Green Bay, Wis., to form a single horizontal water plane at the height of 596 feet A. T. or 15 feet above Lake Michigan.

The correspondence of this series of raised beaches with those studied and described by J. W. Spencer east of Lake Huron and Georgian Bay was discussed. The extension of the profile northward to the Sault Ste. Marie indicated a probable correlation between the raised beaches bordering Lake Michigan and those of the Superior Basin.

*Earth Movements in the Laurentian Basin Since its Occupation by the Ice:* WILLIAM HERBERT HOBBS, Ann Arbor, Mich.

The introduction of precise leveling to determine the present positions and altitudes of the abandoned shore lines within the Laurentian Basin, as indicated in the last paper, has opened a new era of study of the earth movements which have taken place within this province since the Pleistocene glaciation. Professor Hobbs's paper was a discussion of problems the solution of which was sought in field work undertaken for the Michigan Geological Survey during the season of 1907.

*A Review of the Great Lakes History, with Special Reference to the Deformation of the Ancient Water Planes:* FRANK B. TAYLOR, Fort Wayne, Ind.

South of the line passing through Lake St. Clair and Ashtabula, Ohio, the ancient beaches are substantially horizontal, and they are the same around the southern third of Lake Michigan, as shown by Professor Goldthwait. North of this, in the Lake Michigan Basin, the beaches above the Algonquin beach are all tilted upward towards the north; in the Lake Huron Basin they are tilted upwards towards the north-northeast, the rate being a foot to the mile or less.

The Algonquin beach keeps horizontal for about 100 miles farther north than the others in both basins. Then it begins to rise towards the north; for the first fifty miles at a rate of nearly one foot per mile; then for about thirty miles at a rate of a little more than two feet per mile; and then for at least fifty miles and perhaps farther at a rate of more than three and a half feet per mile. The rate of uplift east of Lake Huron seems slightly greater than in the Lakes Michigan and Superior basins. The direction of maximum rise is about north-northeast east of Lake Huron and nearly north in the Lake Michigan Basin.

The Kirkfield outlet of the Algonquin to the Trent Valley in Ontario was discussed and it was shown that the opening of this outlet lowered the level of Lake Algonquin at least 40 or 50 feet, and that at this time the ice sheet had withdrawn from all of the Lake Michigan Basin, from nearly all of the Lake Huron Basin, and probably from much of the Lake Superior Basin. Lake Algonquin was at first confined to the Lake Huron Basin with its outlet at Port Huron. Whether its mergence with Lake Chicago occurred before or after the opening of the Kirkfield outlet is not known. The Kirkfield outlet was in the area of great uplift and was soon carried up to a higher altitude than the old outlet at Port Huron, to which place the discharge was then returned. The uplift then continued, at first slowly, but later with rela-

tive rapidity, producing before its close the remarkable series of northward splitting beaches which are associated with Lake Algonquin.

Following the discussion of the beaches of Lake Algonquin, the Nipissing Great Lakes were described with their outlet eastward through Lake Nipissing to the Ottawa River. Continuing uplift raised this outlet and turned the discharge of the upper lakes back once more to Port Huron, where it has remained to the present time.

The character of the causes of the deformation of the old water planes was discussed very briefly (*a*) with reference to the effects produced on the water planes within the Great Lake area, (*b*) in the light of Pleistocene deformations affecting wider areas, and (*c*) in the light of the leading theories concerning the conditions of matter in the interior of the earth.

*The Mississippian Section in Illinois:* Stuart Weller, Chicago, Ill.

No detailed studies of the Mississippian rocks of Illinois have been reported for over a generation. In the meantime much progress has been made in the study of the equivalent formations in neighboring states, and much information regarding them has accumulated. In view of these conditions it has seemed desirable to conduct a series of investigations upon these formations in Illinois where the typical sections occur, using the more modern methods of stratigraphy and paleontology. The present paper is a report of progress of these studies which have been carried on during the last two years.

*Devonic Elements in the Late Siluric Fauna of Southern Michigan:*[3] A. W. Grabau, New York, and W. H. Sherzer, Ypsilanti, Mich. (Read by W. H. Sherzer.)

In southern Michigan the Monroe formation forms the upper part of the Siluric. In the upper part of this formation and about 200 feet below its summit is an intercalated coral-reef limestone 40 to 50 feet thick, made up of Siluric and Devonic stromatoporoids and corals, and containing, besides, a number of other fossils related to species elsewhere in this country known only from the lower Middle Devonic. The highest beds of the region contain an upper Siluric fauna of European affinity. The bearing of these facts on the paleogeography of the Upper Siluric and on faunal development and migration was discussed.

*Notes on the Traverse Group of Michigan:*[4] A. W. Grabau, New York City. (Read by W. H. Sherzer, Ypsilanti, Mich.)

During the progress of the study of the stratigraphy and faunas of the Traverse Group of northern lower Michigan—a number of distinct faunal divisions have appeared. The subdivisions of the group and the migrations of the successive faunas were considered, and the progressive evolution of some of the characteristic species was traced.

*The Evolution and Distribution of the Plesiosaurs:* S. W. Williston, Chicago, Ill.

The known range of the Plesiosauria of North America is from the Upper Jura (Baptanodon beds) to the middle or upper part of the Fort Pierre Cretaceous. A comparison of nearly all the known material from North America with much of that from Europe gives assurance that no known genus is certainly common to the two continents. The genus *Plesiosaurus,* especially, the most generalized of the known plesiosaurs, is certainly not represented by any known species in America.

[3] By permission of Dr. A. C. Lane, state geologist of Michigan.

[4] By permission of Dr. A. C. Lane, state geologist of Michigan.

The American forms, moreover, present a higher degree of specialization than is known among the European. As stated by the author in an earlier paper, the plesiosaurs as a group, which at least is of subordinal rank, present sufficiently wide and distinct divergences of structure to warrant their separation into a number of well-marked families, families distinguished by structural characters fully the equivalent of those used in the classification of modern reptiles. Of these families, the author is prepared to define at least three from North America: the Elasmosauridæ, characterized by the greatly elongated neck, absence of interclavicle and interclavicular foramen, and the broad separation of the coracoids posteriorly, especially; the Polycotylidæ, by the presence of a large interpterygoidal foramen anterior to the parasphenoid, large interclavicle and interclavicular foramen, three or four epipodial bones, etc.; the Brachaucheniidæ, by the broad union of the pterygoids anteriorly, the absence of interpterygoidal foramen, very short neck, etc. He believes that at least two other families will have to be erected for the reception of known forms.

*On the Discovery of Vertebrate Fossils in the Pennsylvanian, near Pittsburgh, Pa.:* PERCY E. RAYMOND, Pittsburgh, Pa.

In the clay which underlies the Ames limestone the writer has found remains of vertebrate fossils. These fossils have been identified by Dr. W. D. Matthew and Professor E. C. Case as belonging to amphibians, theromorph reptiles and pelycosaurian reptiles. As the horizon from which these bones were obtained is in the Conemaugh series about midway between the top of the Mississippian and the base of the Dunkard series (Permian), it seems probable that these are the oldest reptiles yet discovered. It has been suggested that the beds which contain these fossils are of Permian age, but in spite of the affinity of these forms with the Permian species, the preponderance of evidence at the present time is in favor of retaining the Conemaugh series in the Pennsylvanian.

*On the Discovery of Pelycosaurian Remains in Rocks of Pennsylvanian Age near Pittsburgh, Pa.:* E. C. CASE, Ann Arbor, Mich. (Read by title.)

*The Lignite of Mississippi:* CALVIN S. BROWN, University Post Office, Mississippi.

This paper described the situation and topography of those portions of Mississippi that are known to be underlain by lignite. The mode of occurrence and geological relationship of the lignite beds were outlined and the character of the material in composition and its value as a combustible were briefly sketched.

*The Influence of the Tides on the Earth's Rotation:* T. C. CHAMBERLIN, Chicago, Ill.

The ultimate purpose of the study was to determine whether changes in the rate of the earth's rotation have been serious factors in its deformation. The problem may be approached from the astronomic and from the geologic points of view. The former are largely cosmogonic and tidal, and the tidal involve the cosmogonic. The inferences from the older cosmogonies involve gaseous and molten states, as well as the separation of the moon from the earth; and are thus radically different from the inferences drawn from a cosmogonic hypothesis which permits a rigid elastic state of the earth from its beginning. The subject is, therefore, open to reconsideration in the light of alternative hypotheses.

The necessity for treating the tides as the phenomena of essentially independent bodies of water lying in irregular basins on the surface of the lithosphere was shown by

citations from the co-tidal charts recently issued by the U. S. Coast and Geodetic Survey. Attention was called to certain anomalies in the relative heights and peculiar behavior of the tides which render difficult any explanation on the usual lines, and Harris's theory of their essential origin in special segments of the oceans was briefly sketched. In addition to this, an inertia tide, assigned to the tilting of the basins by the tidal deformation of the lithosphere, was suggested as a supplementary possibility, but its quantitative value was not estimated or urged.

The normal oscillations of the earth as a spheroid were briefly discussed in the light of mathematical deductions and of certain seismic, nutational and tidal phenomena, with the general conclusion that the lithospheric pulsations, whether tidal or otherwise, have a short period and, in the case of the tides, act directly with the forcing agency.

An attempt to analyze and estimate the influence of the water tides as a retarding agency by the usual method based on the positions of the tidal protuberances, was found not only impracticable because of its intricacies and theoretical uncertainties, but because it involved an unrecognized factor that renders the method misleading. Moulton has found that all energy which is converted into heat by the friction or impact of the lunar tides and lost by dissipation, must in the present configuration of the earth-moon system be taken from the rotation of the earth and the revolution of the earth-moon system in the proportion of 27:1, and that the rotation of the earth must be reduced and the moon must retire, and that *this is independent of the kind or phase of the tide.* It is, therefore, only necessary to estimate the total loss of energy by the tides and subtract the appropriate portion of this from the rotational energy of the earth to ascertain its retarding effects.

The data for such an estimate were put into a tractable form, with large assumptions of tidal height and frictional zones, and submitted to W. D. MacMillan for computation by the formulas used by engineers. The result gave an increase in the day of one second in 460,000 years, or less than four minutes in 100,000,000 years.

The geological evidences were discussed on the basis of a series of spheroidal deformations corresponding to a series of rates of revolution computed by Slichter. It was found that changes of rotation would cause distinctive kinds of deformation of which no distinct traces could be detected. The distributions of the hydrosphere through the geological ages were also found incompatible with the theory of appreciable change of rotation. These negative evidences of the geological record are in close harmony with the computed effects on the revised basis.

*Glacial Erosion in Wales:* W. M. Davis, Cambridge, Mass.

The mountains of north Wales are peculiarly significant in the problem of glacial erosion, because they retain in part forms little changed from those which are not producible by normal erosion, but which are eminently characteristic of the forms that glaciers would produce if they acted as eroding agents. In order to appreciate the meaning of these contrasted forms, it is essential that the observer should have in mind a clear picture of the forms appropriate to subdued mountains that have been acted on only by normal agencies. The general absence of such mountains in western Europe has delayed the recognition of the glacial origin of a number of abnormal features.

*Beginning and Recession of Saint Anthony's Falls:* F. W. SARDESON, Minneapolis, Minn.

The character of the Mississippi gorge from Fort Snelling to St. Anthony's Falls was outlined and a description was given of the terraces and abandoned gorges, to show that the falls have increased in height during their recession. The early history of St. Anthony's Falls was described in detail and the formerly estimated rate of recession of the falls was revised.

*Arched Structure in Lockport Limestone:* H. L. FAIRCHILD, Rochester, N. Y.

The author exhibited a few lantern views showing arching layers in the Lockport (Niagara) limestone at Niagara Falls. This peculiar structure has been known for seventy years and was figured in Hall's report on the fourth (New York) district, 1843, but no satisfactory explanation of the phenomenon has been found.

*Correlation of Distribution of Copper and Diamonds in the Glacial Drift of the Great Lakes Region:* OLIVER C. FARRINGTON, Chicago, Ill.

The distribution of copper in the glacial drift south of the Great Lakes resembles closely that of the diamonds which have been discovered in the same region. As the source of the copper is known to be the rocks bordering the shores of Lake Superior, it seems probable that the source of the diamonds was in the same region.

*The Alteration of Glacial Deposits by Later Ice-invasions:* FRANK CARNEY, Granville, Ohio.

The readvance of an ice-sheet subjects the drift already accumulated to gradation which probably removes much of it, and to differential stresses which presumably alter the portion not removed. The extent of this alteration is influenced (1) by the length of the interval of deglaciation, a control that is further conditioned (*a*) by cementation of the early drift, whether till or modified deposits, and (*b*) by topography; (2) by the thickness or weight of the over-riding ice; (3) by the activity of the ice, especially if at different times the predominant motion varied somewhat in direction. The change brought about in over-ridden drift differs with the nature of the drift: if till, the changes produced are disturbance or distortion, foliation, induration, jointing, faulting, and apparently color-alteration; if modified deposits, distortion, jointing, faulting, but only slight foliation and induration.

The presence of such alteration in drift in proximity to drift bearing no such evidence suggests that the two represent distinct ice-epochs.

*A Demonstration of the Curvature of the Earth's Surface:* ROBERT M. BROWN, Worcester, Mass.

The paper recorded an observation by the writer on the curvature of the earth at Lake Quinsigamond, near Worcester, Mass. A board two feet square, divided vertically into a black upper surface and a white lower one, was set up with the union of the two surfaces at a certain height above water level. On an island about 4,000 feet away a white bar was erected, parallel to the water and at the height of the horizontal line of the first piece of apparatus. In line with these two and about 4,000 feet beyond the second piece, a telescope was set at the given height above the water. On sighting through the instrument the bar was projected against the top of the board. A scale suspended from the bar showed the amount of deviation from a straight line. From this reading the size of the earth was deduced.[5]

[5] Printed in full in the *National Geographic Magazine*, Vol. XVIII., 1907, 771–774.

*Working Hypothesis on the Physiography of Alaska:* WALLACE W. ATWOOD, Chicago, Ill.

Associated with the study of the Cretaceous and Tertiary formations in the district of Alaska, it has been necessary to consider with some care the physiographic history of the district. In the coastal provinces there has long been recognized a great peneplain which is now represented by the summits of the Coast ranges. This is shown in southeastern Alaska, along the gulf of Alaska and on the Kenai Peninsula.

In the Controller Bay region and in the Cook Inlet region, distinct peneplains were recognized below the summits of the Coast ranges. In the Cook Inlet region the lower peneplain is post-Kenai (Oligocene) and the upper or summit peneplain, there represented by the crest of the Kenai Peninsula, is certainly pre-Kenai. Through the Kenai Peninsula there are certain passes which correspond in elevation with the general level of the lower peneplain, and which are the valleys developed during the period when the second peneplain was being developed.

In crossing the Coast range at White Pass, the uppermost or summit peneplain is readily recognized, but below this level there is a system of broad open valleys in which White Pass, Chilcoot and Chilcat Pass belong. Passing to the northward and down the head waters of the Yukon system, the uppermost, or summit peneplain, was traceable, but the remnants which reached that level became less and less in extent and in number. At Cariboo, in the Yukon territory, an intermediate bench appears and to the northward many more extensive benches and ridges reach that intermediate level. Before reaching Dawson the intermediate horizon is seen to represent the summit of the Yukon plateau. This plateau has been recognized by many as a great peneplain, and its correlation with the summit peneplain has been suggested. The studies during the past season would indicate that these two great Peneplains are distinct, and suggest, at least, that the broad passes through the Coast ranges are of the same age as the Yukon plateau peneplain.

In the central portion of the great Yukon plateau area between Eagle and Fairbanks, the Yukon plateau is well shown, and rising above it there are many monadnock forms which belong to the earlier or summit peneplain of the Coast ranges. There are also distinct benches below the Yukon plateau, and from 1,200 to 1,400 feet above sea-level, which attract attention. They are represented at Eagle by a low ridge just south of town, and in the valley of Seventy Mile and Mission Creek, by broad open valleys above the present gorges.

Continuing the studies farther down stream, the upper peneplains became less and less conspicuous, and the lower one grew in importance and then took a lesser place, as the modern peneplain, represented by the broad alluvial flats of the lower Yukon, Koyukuk and Kuskokwim rivers became more conspicuous.

The hypothesis stated briefly is that the great summit peneplain of the coastal province is distinct from certain lower peneplains bordering the Pacific and from the Yukon plateau peneplain of the interior; that in the Yukon basin there have been several peneplains developed and that each process of peneplaination has moved as a wave up that basin from the westward, just as the modern peneplain is today moving up that valley; that the extent and number of remnants of each peneplain decrease from the headwaters of the Yukon toward the mouth, just as terrace remnants in a single valley may decrease from their up-stream termini to the lower portion of

the valley; that the lower peneplains of the Pacific coast provinces may possibly be correlated with the Yukon plateau peneplain, or with still lower erosion surfaces in the interior; that Schrader's Koyukuk plateau, just south of the Endicott Mountains, is to be correlated with the 1,200–1,400 foot peneplain recognized in remnants along the Yukon and its tributaries near Eagle, and by more extensive areas farther down the valley; that the summit peneplain of the Rocky Mountains described by Schrader may be of the same age as the summit peneplain of the Coast ranges.

*The Honeoye-Irondequoit Kame-Moraine:* CHARLES R. DRYER, Terre Haute, Indiana.

The range of drift hills described extends about fourteen miles in the counties of Livingston, Monroe, and Ontario, N. Y. It is divided by transverse valleys into three principal portions. (1) The Irondequoit-Turk Hill portion consists of heavy Kame deposits in the Irondequoit Valley, which, extending eastward over the Turk Hills, appear to be a group of large drumloids, partly buried and masked by sands and gravel. (2) The Gahyandock Hills consist of massive Kame deposits, superposed upon a basal terminal moraine, the surface of which is exposed in the bordering plateaus. These hills rise to 1,100 feet A. T. (3) The Bloomfield-Lima Kame-moraine adjoins (2) on the south, and consists of a gravel outwash plain on the north, changing to a typical terminal moraine at the southern end.

The range is cut through by the present valley of Honeoye Creek at its southern end, where well borings show the presence of a deeply drift filled preglacial valley. (1) and (2) are separated by the Rush-Victor glacial river valley which was a line of eastward drainage for melting ice and subsequent lake waters. The filled valley of the lower Irondequoit has a rock bottom below the level of Lake Ontario and is thought to have been the preglacial outlet of the Honeoye Valley. The whole range was a continuous marginal deposit during the retreat of the Wisconsin ice sheet and marks the position of the debouchment of a powerful subglacial stream.

*Glacial Lake Bloomfield:* CHARLES R. DRYER, Terre Haute, Indiana.

Numerous deltas in the Honeoye and Hemlock Valleys in Ontario and Livingston Counties, N. Y., at the 1,000-foot level A. T., indicate the existence of an ice-dammed lake which succeeded the glacial Honeoye and Hemlock Lakes described by Fairchild, and immediately preceding Lake Warren. Its principal outlet was across the divide eastward to the Bristol Valley. A later and lesser outlet was opened to the northeast near the village of East Bloomfield. Two smaller spillways to the west may have been briefly active. The northern border of Lake Bloomfield was formed by the margin of the ice, when it stretched from the Gahyandock Hills to the north end of a ridge three miles west of Lima Village.

*The Loesses of the Mississippi Valley:* B. SHIMEK, Iowa City, Iowa.

Evidence was presented to the effect that a loess deposit followed each drift sheet, and that the loesses are inter- and post-glacial. This conclusion is supported by the vertical position of the loesses with reference to the drift-sheets; by geographical position, the best illustrations occurring near the borders of drift-sheets; by root-tubes; by fossils; by differences in texture and composition.

*The Gases in Rocks:* R. T. CHAMBERLIN, Chicago, Ill. (Read by T. C. Chamberlin.)

Some of the results of 112 analyses of the gases derived from a wide range of

rocks, and a part of the generalizations based upon these were presented. A classification of the analyses according to the types of igneous rocks brought out the fact that, while the rocks of each group may vary considerably among themselves, the group as a whole fits into a logical place in relation to the other groups. Arranged in the order of the total volumes of gas evolved per unit volume of rock, the types of rock rank thus: (1) Basic schists, (2) diabases and basalts, (3) gabbros and diorites, (4) granites and gneisses, (5) andesites, (6) syenites, (7) rhyolites.

A classification on the basis of the age of the rocks showed a rapid and steady decline in the quantity of every gas in passing up the columns from Archean to Recent lavas. Fine-grained rocks were found to give off more gas than those of coarser granularity.

A series of special experiments showed that the gases obtained from heating rock material in vacuo come from three sources: (1) Gas held mechanically in minute cavities and pores, (2) gas occluded within the substance of the rock, and (3) gas produced by chemical interaction between the non-gaseous constituents of the rocks at the high temperatures used.

An average of 51 analyses of the gas from igneous rocks, expressed in volumes of each gas per unit volume of rock, gives the following figures: $H_2S$, .01; $CO_2$, 2.16; CO, .18; $CH_4$, .05; $H_2$, 1.36; $N_2$, .09; and total, 3.85.

It was found that rock powders which had ceased to give off gas in combustion tube, and were apparently exhausted of their gas content, were able, when re-heated after an interval of several months, to produce a considerable quantity of additional gas amounting, in some cases, to as much as half the volume originally obtained. Test experiments showed that this was not the result of a selective absorption of gases from the atmosphere during the interval, but was due to some kind of diffusion or molecular rearrangement going on slowly within the rock material.

The significance of these gases, existing in a threefold state so generally and in so large a variety of rocks, and their bearings on some of the problems of vulcanism and of the atmosphere were indicated.

In the discussion that followed the reading of this paper reference was made to the bearing of the results upon the explanation of causes of gas explosions in mines. Dr. A. J. Holmes, chief of the technical branch of the U. S. Geological Survey, in the course of his remarks on the subject, gave a report of progress of the investigations undertaken by the survey to establish the cause of the recent disastrous explosions in coal mines.

*Work of the United States Reclamation Service:* E. T. Perkins, Chicago, Illinois.

This paper was a summary of the results obtained by irrigation in the United States and other countries, and a statement of the work being done by the U. S. Reclamation Service.

*Fjords of Puget Sound and the Saguenay:* Warren Upham, St. Paul, Minn.

This paper presented the results of the study of the Puget Sound and the Saguenay regions.

Puget Sound and its many long and narrow arms, called canals, from 100 to 600 feet in depth beneath the sea level, are admirable examples of fjords opening northward, running thus toward the interior of the ice-sheet which during the glacial period covered this district, being the southern part of the continental ice-sheet west of the Rocky Mountains. It is impossible to ascribe the depth of these fjords to glacial erosion because they run in courses opposed to the courses of glacial erosion and transportation of material eroded.

The Saguenay Fjord, sixty miles long, river-like in its nearly uniform width and its somewhat winding course, with a depth from nearly 500 to 900 feet beneath the sea level, continuously enclosed on each side by steep or precipitous bluffs and cliffs 500 to 1,500 feet high, is regarded as a very typical fjord of the Norwegian type.

Both the fjords of Puget Sound and of the Saguenay have been eroded alike by river channeling before the Ice Age, showing, with the other fjords farther north, that this continent was greatly uplifted during a considerable time preceding the continental glaciation. Such high land elevation the author believes to have caused the cold climate and the accumulation of snow and ice which characterized the Glacial Period.

W. S. BAYLEY,
*Secretary pro tem.*

### THE HANOVER MEETING

Section E, Geology and Geography, proposes to give a series of excursions to various points in Vermont and New Hampshire in connection with the meeting of the American Association for the Advancement of Science at Hanover this summer.

A tentative plan is the following:

1. The first excursion to be under Dr. Wolff, of Harvard University, starting from Bellows Falls, Vt., Friday, June 26. This will be a trip across the Green Mountains, arriving at Rutland, Vt., some time on Saturday.

2. An excursion with Professor G. H. Perkins, state geologist of Vermont, to some of the marble quarries.

3. An excursion to Ascutney Mountain, Vermont, under Dr. R. A. Daly.

4. A trip to the Quechee River local glacier under Professor Hitchcock, of Dartmouth.

5. A study of the terraces of the Connecticut River.

6. A day in the Corbin Park to see the buffaloes, etc.

7. A trip of one to three days around Littleton, N. H.

8. A trip to Mt. Monadnock, if enough care to go.

9. A trip to one of the points of interest for economic geology.

10. The final excursion will be made to the Summit House on Mt. Washington, where greatly reduced rates have been secured for a stay of from a day to a week.

It will greatly assist in making arrangements for the meeting if all those who have any thought of taking part in these excursions will send word as soon as possible to

F. P. GULLIVER,
*Secretary Section E*

30 HUNTINGTON LANE,
NORWICH, CONN.

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### *A PLAN FOR AN EXCHANGE OF TEACHERS BETWEEN PRUSSIA AND THE UNITED STATES*[1]

ON behalf of the Department of Ecclesiastical Affairs, Instruction and Medical Affairs of Prussia, Geheimer Ober-Regierungsrat, Dr. Karl Reinhardt, addressed the Carnegie Foundation for the Advancement of Teaching in the summer of 1907 and laid before it a plan for an exchange of teachers between Prussia and the United States. An exchange similar to the one proposed is now in effect between Prussia on the one side, and France and England on the other; and in view of the usefulness of this work, not only in the school systems of the respective countries, but also in the better feeling and understanding of the countries, Dr. Reinhardt urged the exten-

[1] Bulletin issued by the Carnegie Foundation for the Advancement of Teaching. The committee of arrangements consists of Dr. Henry S. Pritchett, president of the foundation, Professors Julius Sachs and Calvin Thomas, Columbia University, and Headmaster James G. Croswell, Brearley School, New York.

sion of the plan to America. He requested that the foundation act in an official capacity with the royal government of Prussia and that it arrange all details of the exchange for this side of the ocean.

Upon receipt of the communication from the Prussian minister, the president of the Carnegie Foundation brought the matter to the attention of the trustees, and at the meeting of the trustees in November, 1907, it was voted that the president of the foundation should undertake the supervision, on the American side, of the exchange with Prussia. This bulletin is prepared, therefore, in order, first, to suggest the general nature and value of the system, and, second, to give the details by which it is to be put into operation. It is addressed especially to presidents of colleges, universities and normal schools, to superintendents of schools and members of school boards, and to teachers who may wish to consider spending a year or a half year in Prussia under the conditions offered by the Prussian government.

### GENERAL NATURE OF THE SYSTEM

The plan for this exchange of teachers is to effect a permanent arrangement by which teachers of the United States shall be assigned for a year or half year to schools in Prussia, and *vice versa*. The instruction to be given in Prussia will be the teaching of English in a conversational way. It is not, however, necessary that the teacher should be a teacher of language in this country, but that he should be a cultured man able to conduct such exercises in an interesting manner.

The significance of the interchange of teachers between countries in Europe has greatly increased during the last two years. The immediate end gained by the exchange of teachers of language is the vitalizing of the instruction in foreign languages and the correction of defects in the system of instruction in one country or the other. But the indirect products of the exchange are far more important. A teacher transplanted for a year to a school in a foreign country has the opportunity to improve his whole view of educational methods. He returns to his regular work with increased efficiency and with freshened ability to teach.

By such an exchange students at an impressionable age learn of the social customs and gain the point of view of the people of the other country, and this under an arrangement which is stimulating and interesting in comparison with the formal language study.

The exchange is, therefore, one that ministers not only to the improvement of the teaching of modern languages, but to general educational efficiency, to a broader understanding of other countries and a betterment of international relations.

From the point of view of the young, ambitious American teacher, the opportunity to spend a year in Prussia is an attractive one and should be considered in about the same way as a fellowship in a good American university. In either case the remuneration is slight. The American teacher who goes to Prussia for a year will receive from the Prussian government from one hundred to one hundred and ten marks a month ($25 to $27.50). It is estimated that this is equivalent to about $40 to $45 a month in a small town in the United States, and that it will meet the actual living expenses of the teacher during the year.

The remuneration is a secondary consideration. Teachers, especially those who are now serving their apprenticeships as scholars or fellows in colleges and universities, preparing themselves for the profession of teaching, will recognize the benefit which a

year of study and conversational teaching in Prussia would bring them. The opportunity is virtually that of a traveling fellowship. The teachers have the right to attend instruction in all classes of the institution so far as it is beneficial to their work. Many teachers in the United States who consider the plan may not welcome the idea that they are to remain at one particular institution during their official connection with the school system in Prussia; and that, further, they are under the direct guidance of the director of the institution to which they are assigned. These restrictions, however, have their advantages. The privilege of becoming acquainted with the school system of Germany in all its working details and the fact that this privilege is accorded the visiting teachers under most dignified and agreeable circumstances are worthy of emphasis. The director of an institution to which a teacher is assigned will, with his colleagues, take a personal interest in introducing the teacher into the social life of the community. Good-fellowship is extended to him, and with this the opportunity to gain an intimate knowledge of German ideals in teaching and to observe German methods in practise. In the United States such an opportunity is usually accorded a visitor who gives evidence of sincerity in his desire for the privilege, but in Prussia the privilege is rarely granted to any one except through formal application to the Royal Minister of Instruction.

In no case are teachers to take part in the formal instruction of the institution which they visit. They do not do the work, or even part of the work, of a regular teacher. This would impose too heavy a burden upon the visitors and would render their relationship with the students too didactic. The plan is for the visiting teacher to teach conversation in his own language in an informal manner for not more that two hours each day, his classes being small groups of upper classmen who wish to perfect themselves in the language of the teacher. The students and the teacher discuss the manners and customs of the teacher's home, the school arrangements, the family life, the conditions of public life, the social usages, etc. Work of this nature will not interfere with the teacher's leisure for study and observation, and for short trips to communities other than his own.

### DETAILS OF THE SYSTEM

All matters of business connected with the exchange of teachers are transacted either through the Prussian Minister, whose address is Berlin W, 64, Wilhelmstrasse 68, or through the Carnegie Foundation for the Advancement of Teaching, 576 Fifth Avenue, New York City. All communications from those interested in the matter in the United States should be addressed to the president of the Carnegie Foundation for the Advancement of Teaching.

All applications from institutions for teachers from Prussia and for appointments of individuals to go to Prussia should be filed at the office of the foundation not later than June 15, to go into effect in October. In making application a teacher should give his full name, address, date and place of birth, citizenship, religious faith, academic preparation for teaching and information concerning his fitness for the work, and preference in regard to situation in Prussia. Formal application blanks for this purpose may be had upon request from the offices of the foundation.

The candidate for appointment to a position in Prussia should be a graduate of a college which requires for admission the usual four-year high school course. He must have been for at least one year a teacher, though not necessarily a teacher

of languages, and must have reasonable facility in the German language. The teacher who goes to Prussia will enter a *gymnasium* or a *real-gymnasium*. His work will be the informal teaching of the English language by means of conversation. As stated in the general discussion, the remuneration is one hundred to one hundred and ten marks a month paid by the Prussian government in monthly instalments.

A teacher coming to the United States from Prussia may enter a college or a high school of good standing. His work, similar to that of the American teacher assigned to a post in Prussia, will be the teaching of the German language by means of conversation. The Prussian teacher for appointment in the United States must be a graduate of a German university and must have served for at least a year as a probationary teacher under the director of a *gymnasium*.

Any educational institution or city school board which makes application for a Prussian teacher must agree to pay the visiting teacher a sufficient sum to meet modest living expenses such as board, room, laundry, etc. In no case should this amount be less than the monthly allowance which the Prussian government pays to an American teacher in Prussia. An amount of approximately fifty dollars a month for a period of eight months will usually meet the requirement. The amount will vary according to location.

Many colleges, universities and normal schools which have departments of German will probably be glad not only to select a representative to go to Prussia, but also to receive in return a Prussian teacher who would doubtless stimulate a new interest in the work of the department. It is not necessary, however, that an institution which receives a Prussian teacher should also nominate a teacher to go to Prussia; nor that if an institution sends a teacher to Prussia it receive a foreign teacher in return.

The Prussian government pays all the necessary traveling expenses of the teachers selected to come to America. While many of the American teachers will probably be willing to pay their own traveling expenses to Prussia, it is hoped that institutions which nominate the individual teacher will also pay the transportation to Prussia, thus making the appointment one of distinction and honor as well as an educational opportunity.

All appointments are made either for one academic year or for one half of the academic year. The year begins at Easter and is divided into two terms, the second term beginning about October 1. There are generally two weeks vacation at Easter, two weeks at Christmas, one week at Whitsuntide, and about four weeks in June or August, according to the arrangement of the ministry.

In accepting an appointment from either country, teachers pledge themselves not to publish anything concerning the institutions with which they are connected except with the permission of the proper authorities. This restriction is a nominal one. It is understood that there will be no objection to any serious and well-informed publication on the part of the visiting teacher.

At the present time women are not eligible to appointments as exchange teachers with Prussia.

American teachers who take these appointments are expected to render a report at the end of their service to the president of the Carnegie Foundation concerning such matters as seem to them important or to have educational value.

The Carnegie Foundation assumes no

financial responsibility in acting as an agent in this exchange of teachers.

## SCIENTIFIC BOOKS

*Comparative Anatomy of Vertebrates.* Adapted from the German of Dr. Robert Wiedersheim, Professor of Anatomy in Freiburg, by W. N. PARKER, Professor of Zoology in the University of Wales. Royal octavo, pp. 576, 372 figures. Macmillan and Co., 1907. Third edition, founded on the sixth German edition (pp. 800, 416 figures).

As indicated in the preface and upon the title-page, this is not a literal translation, but a reduced "adaptation," a more difficult task which also throws a greater responsibility upon the adapter. Although former editions have been—and this will doubtless be—consulted by investigators and teachers, that it was prepared chiefly for students is stated upon the title-page of the original and in the preface of the adaptation; its substance and form, therefore, may fairly be judged from the standpoint of those who seek information and who expect a text-book or reference-book to be not merely correct, but well arranged, clear, consistent and approximately complete. Furthermore, while the fact that a technical work of this size has reached a sixth edition in one language and a third in another constitutes a presumption of its general acceptability, it is likewise warrant for what, under other conditions, might seem hypercriticism. The reviewer takes the ground that there is no excuse whatever for lack of clearness or coordination, and that for inaccuracy the only valid excuse is the advance of knowledge since the volume went to press. He holds, also, that rigid and unsparing criticism of works like the present is required if biology is to compete educationally with the more exact sciences and with the languages. Recognizing his own limitations, the reviewer hopes that others may contribute, to the end that future editions in both languages may be beyond criticism in all respects.[1]

Like its predecessors in both languages, this volume excludes the Tunicates and the other lower Chordata; students would welcome some account of these comparatively recent recruits from the "invertebrate mob," or at least references to their treatment elsewhere.

The preface states that "this edition has been almost entirely rewritten." That the changes have not always been for the better is exemplified in the omission of the essential qualification mentioned later in connection with the brain of *Amphioxus*. Careful revision would have averted the need of the following comment. The discussion of the nature and origin of the limbs opens with a paragraph in which the problem is said in the original to have been "seit einer Reihe von Jahren im Vordergrund." In the second English edition this was rendered "attacked vigorously during the last thirty years." In the present edition the entire paragraph is reproduced, *verbatim;* its literal interpretation would eliminate the first third of the period named in its predecessor. The paper and press-work are creditable to the publishers; many of the cuts are original and most of them, whether pictures (Fig. 134), schemas (Fig. 339) or colored diagrams (Fig. 306), are artistic, clear and correct. The least commendable purports to represent the "placoid scales" (Fig. 30). Admittedly "semi-diagrammatic," it need not so nearly resemble a segment of a rather roughly constructed harrow. Among figures in the original that are omitted from the adaptation are the skeletons of the pterodactyl (Fig. 37), *Archæopteryx* (Fig. 19) and *Stegosaurus* (Fig. 30). Among those added to the original are the meroblastic ovum (Fig. 4) and the "diagrammatic longitudinal section of a vertebrate" (Fig. 11).

Respecting this last, criticism is mainly from the pedagogic standpoint, bearing in mind that it occurs at the threshold of a work intended primarily for students. It faces the original's "diagrammatic transverse section." This is very simple and purely schematic,

[1] Some suggestions as to the improvement of the previous edition were made by the reviewer in *The Nation* for October 28, 1886, and an indication of his disappointment may be found in the same periodical for February 13, 1908.

omitting even the heart or a ventral venous trunk representing it. The other is comprehensive and complicated, yet omits the great veins, dorsal and ventral, and even the aorta, the only viscus in the transection besides the enteron; in brief, the two sections are not correlated. Finally, the spleen and the pancreas are so represented as to give the distinct impression of a single continuous organ with a hole at the smaller end. As in most works of the kind, comparable figures are often reversed in direction. Without insisting unduly upon conformity with the practise of the elder Agassiz,[2] for students such reversals are often confusing, especially where different sets of abbreviations are used for the same parts, as in Figs. 149 and 150, 160 and 161, 172 and 173.

In the introduction of sixteen pages, after definitions and general considerations, vertebrate ontogeny is outlined, all too briefly for the student; indeed, only one already familiar with the facts would comprehend either the conversion of the blastula into the gastrula, or the formation of the notochord and neural tube. And what impression would be made upon the average reader as to the dependability of biologic science by the statement (p. 5) that "In all vertebrates the blastophere passes—or did so in earlier times—into," etc., with no "probably" or corresponding German word to indicate that, however well founded, our belief is pure hypothesis, unproven and unprovable? The "general classification of the principal vertebrate groups," although occupying more space than in the original, and with two thirds of page 15 left blank, absolutely ignores extinct forms, even some that are discussed in the text, *e. g.*, *Archæopteryx* (p. 60), *Hesperornis* and *Ichthyornis* (123, 318), *Stegocephali* (142, 148), *Pleuracanthus* (145), *Ichthyosaurus* and *Plesiosaurus* (163). The introduction closes with a full-page "Table Showing the Gradual Development of the Vertebrata in Time." Like the original, it is said to be "modified from H. Credner," but there is no explanation of the further changes, especially the inclusion of the Amphibia and Reptilia in a single column.

The statement on page 63 as to the persistence of the human tail up to a certain embryonic size is undesirably condensed from the original (p. 65); it lacks the two instructive figures there given, and—like the original—it fails to note the presence of a perfectly distinct caudal appendage at a considerably later stage, even though it may not contain the original prolongations of the neural and enteric cavities. The several kinds of tails among fishes might well have received fuller treatment. The figure of *Protopterus* in the original is omitted from the adaptation, and neither portrays a typical heterocercal tail (sturgeons and most sharks), nor the very instructive developmental stages of the gar and some teleosts so fully made known by the younger Agassiz thirty years ago. The account of the relations of the ovaries to the oviducts in teleosts is not clear in the original (p. 559), and still less so in the adaptation (p. 466).

Some of the following features may not commend themselves to all, but they afford the reviewer considerable gratification: The distinct recognition of the importance of the olfactory portion of the brain (pp. 200 and 220); the omission of the "Isthmus rhombencephali" from the encephalic segments; the retention of the correct spelling, *Lepidosteus;* the use of coele and its compounds for the cavities of the brain, and of postcaval and precaval; and the avoidance of "*Anlage.*"

The following statements as to the brain are more or less defective, misleading or erroneous.

Page 201—"The middle commissure is present in mammals only." It exists in the alligator and in all turtles so far as the reviewer is aware. The succeeding paragraph as to the corrugations of the cerebral surface is worded even more loosely than the original; it implies that only the lateral aspect is so modified and that *pallium* and *cortex* are synonymous; fails to distinguish between total and partial fissures, and omits the concluding phrase of the

[2] See American Association for the Advancement of Science, *Proceedings*, 1873, p. 274.

original as to the concomitant increase of the conducting fibrous constituent.

Page 203—The original of the following sentence is characteristically German, but it might have been rendered into more straightforward English: "A series of unpaired ventricles lying in the longitudinal axis of the brain, as well as paired ventricles, can be distinguished."

Page 204—Without the figure that surely should have accompanied this very brief account of the brain of the lowest vertebrate an imperfect idea would be conveyed by the phrase, "kegelförmigen Auftreibung," rendered "conical and enlarged." The presence of an olfactory bulb, mesal at its base, but deflected to the left, never would be inferred from the statement that "the brain cavity opens freely to the exterior dorsally by a neuropore." In the previous English edition this free rendering of the original is properly qualified by the phrase, "in the larva," the omission of which from the present volume conveys an error as radical as would be embodied in the declaration, "man has a short triangular tail," without the qualification, "at a certain stage of development."

Page 210—The account of the selachian forebrain is not clear as to either the developmental stages or the various adult conditions; see also the commentary upon Figs. 157 and 158.

Page 213—As to the olfactory bulbs of teleosts, the original merely remarks (p. 249) in effect that they may be either sessile or pedunculate. The adaptation says "they are either closely applied to the telencephalon [forebrain] and contain a small ventricle, or they become differentiated into tract and bulb, as in elasmobranchs [selachians]." In the absence of any representation of the alleged olfactory ventricles the reviewer, recalling the artifact figured by him in the perch (A. A. A. S., *Proceedings*, 1875, Pl. 3, Fig. 14), apprehends that they may be as insignificant as those discussed the following year (p. 258), and scarcely deserving of the title; certainly, in neither form is there a patent cavity as in sharks and rays.

Page 214—The teleostean cerebellum is by no means always "extremely large"; and while in some, as the salmon (Fig. 160), it is "bent upon itself and overlies the medulla oblongata," in others, *e. g.*, perch, it is erect, and in still others, *e. g.*, catfish, it tilts forward upon the midbrain.

Page 227—The midcommissure may be "large" in most mammals, but in man it is notably small.

Page 228—In both the original and the adaptation it is assumed that the carnivoral cruciate fissure is homologous with the primatial central or Rolandic, but their comparable relation to the chief motor areas of the cortex by no means proves their morphologic identity.

Page 236.—In connection with the ordinary cranial nerves the original devotes two figures and the larger portion of pages 276 and 277 to the new "Nervus terminalis" of Locy (SCIENCE, Aug. 11, 1905, and earlier papers there cited). This was none too much in the opinion of the reviewer, whose appreciation of what he regards as an "epoch-making" series of observations has been briefly expressed in SCIENCE, May 26, 1905, p. 813. Yet the subject is disposed of in the present volume in a foot-note of six lines; the words "in the region of" are superfluous and misleading in respect to both the origin of the nerve in the terma ("lamina terminalis") and its distribution to the olfactory mucosa; worse yet, through a misprint for *Amia* (*Amiatus*) which does not occur in the original, the adaptation credits the nerve to the Anura, notwithstanding Locy's declaration that he searched for it in vain in the frog and toad.

Fig. 145—The uniform line between the two halves of the frog's brain fails to indicate the exceptional coalescence of the olfactory lobes, and there is no reference to the later figure, 164, *B*. In some respects Ecker's figure (145) is less satisfactory than those published in 1853 by Jeffries Wyman, apparently unknown to both author and adapter.

Fig. 148—Without challenging the usefulness of this schema of the three primary "cerebral vesicles" (*encephalic* is the natural equivalent of "Hirnbläschen" as well as more

correct in itself), surely in this connection should at least be mentioned the suggestive observations of Charles Hill as to the eleven neuromeres in teleosts and birds.

Fig. 149—Unless otherwise stated, a "longitudinal" section is assumed to be mesal, or sagittal and parallel with the meson, or at least in one and the same plane. Here the cerebral and olfactory regions are not in the same plane with the rest. No one would be more pleased than the reviewer to find a brain with a single olfactory tract and bulb on the middle line as—in the absence of qualification—is the case in this figure, the "ideal" key to the "real" brains that follow it. The dotted ellipse marked *Tho* ("optic thalamus") might fairly represent the midcommissure connecting the two thalami, but hardly those bodies themselves; see also under Fig. 152.

Fig. 150—In neither the original nor the adaptation is it stated what brain serves as the basis of this diagram.

Fig. 151—Here are five diagrams "illustrating the structure of the hypophysis" (pituitary body). They are not adequately explained in either the general text or the description, and the latter contains words, "chromophilous" and "chromophobic," which, like "chromaffin" (pp. 495–6) are neither defined nor included in the index. Even orientation of these diagrams is difficult since more complete figures with which they might be compared (150, 154, 161, 165, 172) head in the opposite direction.

Fig. 152—This diagram of the "ventricles," as if their roofs were removed, should be coordinated with Fig. 149. Here the side walls of the "third ventricle" might properly be designated *thalami*.

Fig. 153—In a diagram to illustrate the several flexures of the brain there is perhaps no great harm in representing the midbrain as if it were a flattened "lump" suggesting no organic relation with the adjoining segments. This figure, or some other, should exhibit the definite topographic relation of the principal (mesencephalic or cranial) flexure to the cephalic end of the notochord.

Figs. 157 and 158—To these representations of the dorsum, venter, left, and exposed cavities of a shark brain should have been added a midsection. The foramen so conspicuous on the venter is not named or even accounted for in the description or text; yet, as figured and described by the reviewer in 1876 (*Amer. Jour. Science,* Vol. 12, pp. 103–5) it is very significant in connection with the embryonic condition with most sharks and the permanent condition of the more primitive forms.

Fig. 159—From this brain of the gar, as usual with ganoids and teleosts, the telas are omitted, and their absence is hardly accounted for with sufficient clearness in the text. More serious is the lack of qualification respecting the interpretation of the cephalic portion. It is probable that the conditions are essentially the same as in the Teleosts with sessile olfactory bulbs, viz., the wider pair of solid lobes marked *prs.* are the striata, the smaller ones beyond (hollow in ganoid's but practically solid in teleosts), the olfactory bulbs, and the so-called olfactory lobes merely the slightly enlarged beginning of the nerves. It is a reproach to the comparative anatomists of this country that the brain of this exclusively American form should not have been fully elucidated. The reviewer frankly accepts his share and admits the erroneousness of certain interpretations of 1875 (A. A. A. S., *Proceedings,* p. 179 and pl. 2); but in respect to the then prevailing non-recognition of the "morphological importance of the membranous or other thin portions of the parietes of the encephalic cavities" he made a general confession and promise of reform in a paper under the title quoted above, read before the Association of American Anatomists and published in the *Journal of Comparative Neurology,* October, 1891, pp. 201–3.

Fig. 163 represents the dorsum of the brain of *Ceratodus* (*Neoceratodus*), taken by the adapter (unaccountably the author gives no dipnoan brain) from Parker and Haswell's "Zoology." In that work it is said to be "chiefly from Sanders"; it is defective in several unspecified respects and bears no close resemblance to the only figure by that anatomist known to the reviewer, viz., in the

*Annals and Magazine of Natural History,* March, 1889, Pl. VIII.; a more satisfactory figure was published by Bing and Burckhardt in 1905 (*Jenaische Denkschrift,* Vol. IV., p. 518).

Fig. 164, *A, B, C, D*—From the originals these four views of the frog's brain are reduced somewhat, darker and less clear, especially as to the intercerebral fissure. The midsection (*D*) was taken by the author from the paper in the *Morphol. Jahrbuch,* Vol. XII., p. 239, by H. F. Osborn, who was careful to delimit the cut surface resulting from the division of the secondarily coalesced olfactory lobes; the dorsal part of this boundary is omitted in both the original and the adaptation.

Figs. 166 and 167—In all six of the figures of the brains of *Hatteria* and the turtle the slender tracts connecting the cerebral hemispheres with the olfactory bulbs are designated by I, the first of the cranial nerves, as if in the obsolete and misleading anthropotomic sense. The original has a midsection of the *Hatteria* brain, omitted from the adaptation. Both should have included midsections of the bird's and of the rabbit's or other simple eutherian mammal.

Fig. 170—On the ventral and lateral aspects of the rabbit's brain the primary fissure (*r. f.*) demarcating the olfactory tract and hippocampal lobe from the pallium ceases much sooner than in nature.

Fig. 171—In the dorsum of the dog's brain the olfactory bulbs are represented as if coalescent, as in frogs and toads. In the side view the bulb is inadequately demarcated from the tract. On the venter the trapezium is indistinguishable. On both sides the cruciate fissure is made continuous with another; if such a junction really existed in the specimen from which these pictures were made the exceptional feature should have been specified.

Fig. 172—This midsection of a marsupial brain is not in the original, the author of which dismisses with a brief foot-note the vexed question as to the representation of the callosum in implacental mammals. The adapter accepts the negative view of Elliot Smith, but is apparently so impressed by the resemblance of the "hippocampal or dorsal commissure" to the true callosum as to apply the title "splenium" to the rounded junction of the two component laminæ. Neither the original nor the adaptation represents the entire brain of any marsupial or monotreme.

Fig. 173, *A*—In both works this is the only representation of the mesal aspect of a eutherian brain. It is designated simply "human" and "Gehirn des Menschen." In the absence of qualification it would naturally be regarded as of natural size and adult.[3] It is, however (in the adaptation, not the original), said to be "mainly after Reichert." In that anatomist's "Der Bau des menschlichen Gehirns," 1859–61, as to dimensions and certain features it coincides with Fig. 38, a fetal brain estimated at 24–26 weeks; but there are omitted the occipital and calcarine fissures, always deep at that and even earlier stages; the shading is misleading as to the difference between ectal and ental areas, and whereas the cut surfaces of the fibrous pons and callosum are left blank the nearly fiberless midcommissure is conspicuously dotted.

Fig. 173, *B*—This lateral aspect of the adult human cerebrum reproduces Ecker's imperfect fissural schema of forty years ago upon a scale too small for usefulness; the faculty of articulate speech is, by implication, located in the orbital region rather than in the subfrontal ("Broca's") gyrus; there is no glimpse of the insula or hint of its existence under that name, now almost universally employed to the exclusion of the ambiguous "central lobe."

The climax of pictorial misrepresentation is reached in connection with the pons. This is rightly stated to be characteristic of mammals. As such, one would naturally expect it to be fully and clearly described and accurately portrayed. "In mammals the floor [of the oblongata] gives rise anteriorly to a transverse

[3] Compare, in the original of the "B. N. A." (*Archiv für Anat. u. Physiol.,* Anat. Abth., Suppl. Band, 1895), the designation by His of Fig. 20 as "fötales . . . aus dem dritten Monat." It might possibly be at term, but is more probably adult.

band of fibers (pons Varolii)" (p. 203). "The two lateral lobes of the cerebellum are connected by a large commissure, the pons Varolii; this extends round the medulla oblongata ventrally and is more largely developed the higher we pass in the mammalian series" (p. 229). From this and from the subjoined "diagram of the chief systems of fibers of the human brain" there would be gained the impression that the pontile[4] fibers all cross from one cerebellar hemisphere to the other, whereas at least an equal number decussate and either end in pontile cinerea or become deflected to a sagittal direction. In further diminishment of the usefulness of this figure to the uninformed, the fibrous connections of the cerebellum are called "crura" in the description but "peduncles" in the text. Granting, however, that histology is subordinate in a work of this kind, are macroscopic features of the part in question more satisfactorily dealt with? In Fig. 171, the dog's brain, the area corresponding with the pons is fairly well defined, but the line shading gives the impression of a longitudinal direction of the fibers. On the preceding page the figure of the rabbit's brain embodies not only a *suppressio veri*, but a *suggestio falsi*. There is not the least indication of a pons; on the contrary, the mesal furrow is even more marked than in the pons-less bird on the opposite page, and at either side is a longitudinal line as if the lateral margin of an "anterior pyramid." This same figure occurs in former German and English editions, and in the author's "The Structure of Man," with no intimation of its defects; it is also reproduced in both the "Text-book" and the "Manual" of T. J. Parker and Haswell, although correct —if less artistic—pictures of the rabbit's brain are given in T. J. Parker's "Zootomy" and other elementary treatises. The repetition of such a travesty is susceptible of three explanations, viz., either (*a*) the author and the adapter are unaware of the existence of the pons in the rabbit, or (*b*) they have overlooked its omission by the artist, or (*c*) they are indifferent to the just claims of the student for reliable information upon a feature that distinguishes the mammals from all other vertebrates.

The extensive and well-arranged bibliography of the previous edition has evidently been augmented and probably embraces the six hundred additional titles of the last German edition; but there are signs of carelessness in, *e. g.*, the inclusion in the literature of the brain of mammals (p. 528, fifth from foot) of a title referring exclusively to the amphibian brain.

An inserted slip disposes of twenty-six errata. As indexes go, perhaps this volume is not conspicuously deficient; yet probably the following are not all the omissions that might be found: appendix (vermiformis), 311; bends (flexures) of the brain, 204; callosal fissure, 225; central lobe, 227; central sulcus, 228; chromophilous and chromophobic, Fig. 151; chromaffin, 495, 496 and 247; cirri, 312; cortex and olfactory cortex, 220; cruciate sulcus, 228; crura cerebelli, 229; diacœle, 210; flexures of the brain, 204; hippocampal fissure, 225; insula (central lobe), 227; mantle, 200; mesocœle, metacœle and myelocœle, 210; ossa mentalia, 135; paracœle, 210; peduncles of cerebellum, 229; pineal cushion, 201; piriform lobe, 228; postcaval and precaval, 426; rhinal fissure, 225; telocœle, 210; thorax, form of, 70; Zirbelpolster, Fig. 150; about thirty, far too many for either a text-book or a work of reference.

Notwithstanding the deficiencies above enumerated, the present is the best English treatise upon vertebrate anatomy, as the original is the best German. The reviewer sincerely hopes to greet a later faultless edition.

Burt G. Wilder

[4] This is the regular English form (Anglo-paronym) of the Latin *pontilis*, the only correct adjective from *pons;* yet certain medical and scientific writers persist in using *pontal, pontial, pontic, pontine* and *pontinal.*

## *SCIENTIFIC JOURNALS AND ARTICLES*

The April number (volume 9, number 2) of the *Transactions of the American Mathematical Society* contains the following papers:

L. E. DICKSON: "Representations of the general symmetric group as linear groups in finite and infinite fields."

L. P. EISENHART: "Surfaces with isothermal representation of their lines of curvature and their transformations."

J. L. COOLIDGE: "The equilong transformations of space."

A. RANUM: "Concerning linear substitutions of finite period with rational coefficients."

R. B. ALLEN: "On hypercomplex number systems belonging to an arbitrary domain of rationality."

G. D. BIRKHOFF: "On the asymptotic character of the solutions of certain linear differential equations containing a parameter."

G. A. MILLER: "On the holomorph of the cyclic group of order $p^m$."

E. B. VAN VLECK: "On non-measurable sets of points, with an example."

THE April number (volume 14, number 7) of the *Bulletin of the American Mathematical Society* contains the following papers: "Subjective Geometry," by G. W. Hill; "On Higher Congruences and Modular Invariants," by L. E. Dickson; "Note on Jacobi's Equation in the Calculus of Variations," by Max Mason; "On the Distance from a Point to a Surface," by E. R. Hedrick; "A Geometric Representation of the Galois Field," by L. I. Neikirk; "Concerning the Degree of an Irreducible Linear Homogeneous Group," by W. B. Fite; "On the Lorentzian Transformation and the Radiation from a Moving Electron," by F. R. Sharpe; "Shorter Notices" (Walker's On the Resolution of Higher Singularities of Algebraic Curves into Ordinary Nodes, by H. S. White; K. Bopp's Die Kegelschnitte des Gregorius a St. Vincentio in vergleichender Bearbeitung, by F. Cajori; Annuaire du Bureau des Longitudes pour L'An 1908, by E. W. Brown; Kuenen's Die Zustandsgleichung der Gase und Flüssigkeiten und die Kontinuitätstheorie, by E. B. Wilson); "Notes"; "New Publications."

The May number of the *Bulletin* contains: Report of the February Meeting of the American Mathematical Society, by F. N. Cole; Report of the February meeting of the San Francisco Section, by W. A. Manning; "A Fundamental Invariant of the Discontinuous $\zeta$-Groups Defined by the Normal Curves of Order $n$ in a Space of $n$ Dimensions," by J. W. Young; "On Certain Constants Analogous to Fourier's Constants," by C. N. Moore; "Note on the Second Variation in an Isoperimetric Problem," by E. Swift; "Note on a Certain Equation Involving the Function $E(x)$," by R. D. Carmichael; "The Inner Force of a Moving Electron," by F. R. Sharpe; "The Recently Discovered Manuscript of Archimedes," by C. S. Slichter; "Shorter Notices" (P. H. Schoute's Mehrdimensionale Geometrie, II. Teil, Die Polytope, by W. B. Carver; Field's Theory of the Algebraic Functions of a Complex Variable, by J. I. Hutchinson); "Notes"; "New Publications."

## SOCIETIES AND ACADEMIES

### BOSTON SOCIETY OF MEDICAL SCIENCES

A MEETING was held at the Harvard Medical School on March 17, Professor H. C. Ernst presiding. The following papers were presented:

*A Note on a New Thermochemical Method:* Dr. L. J. HENDERSON and C. T. RYDER.

By introducing a reaction mixture into a Dewar flask which is immersed in a very accurately regulated water thermostat, it is possible to obtain very accurate measurements of heats of reaction of slowly progressing reactions. It has been found that in such a system Newton's law holds very accurately, and that the correction thus involved, with proper manipulation, is very small.

*A Series of Ninety-one Blood-cultures:* Dr. LAWRENCE J. RHEA.

*An Intracanalicular Papillary Adeno-fibroma from the Groin,* with lantern illustrations: Mr. E. L. YOUNG.

*The Theory of Neutrality Regulation in the Animal Organism:* Dr. L. J. HENDERSON.

By analysis of the equilibrium between the four substances carbonic acid, sodium bicarbonate, mono-sodium phosphate and di-sodium phosphate, with the aid of the concentration law, it may be shown that previous findings concerning the constitution of such systems are in accord with the theory. Curves have

been constructed which define the equilibrium at 18°, and very accurately at 38°. These studies prove that such systems possess nearly the highest efficiency which can occur in isolated aqueous solutions for the preservation of neutrality. By the intervention of vehicles of escape for some of the above substances, the efficiency of these systems in the body is so far magnified that they far surpass the efficiency of any possible closed aqueous solutions of like concentration in preserving a hydrogen ion concentration near $0.3 \times 10^{-7}$N. It is shown theoretically and experimentally that the alkalinity of blood probably varies materially with the temperature, so that the alkalinity of blood in the body is probably three times as great as it has been believed to be. Moreover the increase in alkalinity in high fever is probably not insignificant.

C. L. Alsberg,
*Secretary*

THE BIOLOGICAL SOCIETY OF WASHINGTON

The 443d meeting was held April 4, 1908, with Vice-President Hay in the chair. Dr. L. O. Howard exhibited a photograph showing a greatly enlarged female of *Diaspis pentagona* containing a forming imago of *Prospalta berlesei* How., and stated that he had just received this photograph from Professor Berlese. The Diaspis is a dangerous enemy to mulberry in south Europe, and the *Prospalta* was imported from America in the hope that it would establish itself in Italy. The photograph indicates that the parasite is breeding in Italy and encourages hope.

Dr. Barton W. Evermann commented briefly on the successful outcome of the attempt made by the Bureau of Fisheries to inoculate fishes with the glochidia of fresh-water mussels, as a stage in the propagation of the latter. The experiments, conducted by Doctors Lefevre and Curtis, of the University of Missouri, were made last fall at La Crosse, Wis., with more than 25,000 fish of various species, and gravid mussels, furnished by Professor U. O. Cox from the Wabash River at Terre Haute, Ind. The young, when ready to be set free from the mussels, were placed in the same water with the fish, which were soon found to have many of the young attached to their gills, fins or other parts, some of the fish bearing several hundred. They remained attached until March, when, as they began to release themselves, the fish were planted in the Mississippi River.

Doctors Lefevre and Curtis have been experimenting for some time under the auspices of the Bureau of Fisheries for the purpose of developing a method of artificially propagating fresh-water mussels on a commercial scale and in the interests of the pearl-bottom industry which has recently grown to enormous importance in this country. They are greatly pleased with the results.

The first paper, by Mr. C. L. Marlatt, was on the subject of "The White Fly Problem in Florida." It was illustrated by numerous lantern slides representing the life history of the insect and means of control, particularly by fumigation.

The systematic position and general characteristics of the white fly (*Aleyrodes citri*) were discussed in connection with a general account of the family Aleyrodidæ. The white fly first appeared in this country in the orange section of Manatee County, Florida, and was present there a great many years before it was scientifically studied and named. It is supposed to be of Chinese origin, but this origin has not been fully established. From the point of its first appearance in Manatee County it has spread throughout Florida and along the Gulf coast into Texas. It may occur in any northern greenhouse, principally on citrus plants, and seems to be able to maintain itself out of doors as far north as Georgia and perhaps South Carolina. The orange growers of California have long feared it and have made a strong effort to keep it out of the state. These efforts were long successful, but in May of 1907 it was found to be well established in north-central California at Marysville, and a little later at Oroville, and still farther south and much closer to the main orange section at a single point near Bakersfield. The strenuous efforts undertaken by the state of California to stamp out these points of infestation were described.

In Florida it is the principal orange pest, and puts a very heavy tax on all citrus products in that state. Its damage comes not only from its direct effect on the tree, but also from the sooty mold which follows its presence and spreads over the upper surface of the leaves and discolors the fruit. An account was given of the work done against this insect, beginning with its first description by Riley and Howard in 1893, the subsequent investigation of it in Florida from the standpoint of the sooty mold by Webber and Swingle in the early 90's, and the later work under the auspices of the Bureau of Entomology now in progress. The characteristics and action of the sooty mold (*Melolia camelliæ*) which lives in the honeydew secreted by this and other allied insects, were described. A snail was illustrated which, during the last few years, has, in a few groves in Manatee County, been apparently a very efficient aid in removing the sooty mold, on which it feeds.

The natural enemies and means of control of the white fly were discussed. No true insect parasites of the white fly are known. Other species of white flies have many parasites, but so far none of these have paid any attention to *Aleyrodes citri*. The principal natural means of control are some four parasitic fungi, comprising two species of *Aschersonia*, known respectively as the yellow white-fly fungus and the red white-fly fungus; one species of *Microcera*, and an undescribed fungus known as the brown fungus. Under favorable conditions these fungi give the groves one clean year in three, with some protection during the other two years. An account of these fungi was given, together with an account of the action of secondary or hyperparasitic fungi. The means of artificially encouraging and disseminating the parasitic fungi were also described.

By means of lantern slides the process of fumigation of orange trees for the white fly during the hibernating period in winter was fully illustrated.

The next paper was by Dr. W. C. Kendall in the form of "Notes on Sebago Lake, Maine." He said that there are nearly 2,000 lakes in the state of Maine, each over 20 acres in extent, of which Sebago Lake is the next to the largest, having an area of approximately 50 square miles, with a greatest depth of 310 feet at the normal level of the lake above the sea.

Biologically the lake is of particular interest, since it is one of the four bodies of water in the state in which the land-locked salmon was indigenous and in which this fish attains the largest size. He stated that two salmon were taken in the State Fish Commission weirs last fall weighing respectively 31¼ and 35½ pounds.

The various views of the past and present regarding the place of this fish in classification were mentioned; also the various theories regarding the reason of its occurrence in fresh water, the speaker favoring the view that it was derived from the migratory or sea salmon and that it is a distinct species.

About fifty pictures were shown on the screen, illustrating the conditions about the lake and its outlet, the Presumpscot River, and some of natural history objects. Of particular interest was one showing honeycomb, but without any contents whatever, attached to a bush with no protection from the weather. It was attached to the twigs of the bush about four feet from the ground. When first found, late in October, there were 50 or 75 living bees on the comb, but before it could be photographed a heavy cold rain destroyed the bees.

In the discussion of this honeycomb, members differed as to whether the pieces had been thrown into the bushes by bee hunters, and afterward attached to the twigs by bees which later took out the honey, or whether it had been originally built in the position in which it was found.

M. C. MARSH,
*Recording Secretary*

## THE TORREY BOTANICAL CLUB

THE meeting for February 11, 1908, was held at the American Museum of Natural History and was called to order by President Rusby at 8:10 P.M. Sixty-five persons were present.

The scientific program of the evening consisted of an illustrated lecture by Dr. A. J.

Grout under the title "A Botanist's Vacation in North Carolina." The lecture was of a semi-popular character and the numerous lantern-slides from photographs taken by the speaker illustrated the scenery and fauna as well as the flora of the mountains of western North Carolina. The speaker's abstract follows:

Seven weeks of last summer's vacation were passed in the "Pink Beds" on the estate of Geo. W. Vanderbilt about forty miles west of Asheville and twelve miles from Brevard. Our visit was made possible and profitable through the assistant director of the Biltmore Forest School, Dr. Clifton D. Howe. The Pink Beds is a mountain valley over 3,000 feet above sea-level and derives its name from the color given to the whole valley in spring by the innumerable blossoms of *Azalea, Rhododendron* and *Kalmia*. The climate is cool, like that of Vermont and New Hampshire, but the almost daily thunderstorms, often almost torrential in character, are an inconvenience to the botanist. The fauna as well as the flora is an interesting mixture of northern and southern forms. Many of the forms which at first seem identical with northern species on closer examination are found to have good varietal or even specific differences. The chipmunk, for instance, is undoubtedly a chipmunk but so dark in color as to be scarcely recognizable when first seen. Of our familiar northern flowers, the daisy, evening-primrose, trailing arbutus, Indian pipe, *Clintonia borealis,* two species of *Trillium,* bluets, Indian turnip and many others are common; of the shrubs, witch-hazel, *Kalmia, Rhododendron maximum,* the pink, and the white, azalea are noticeable; of the trees, the chestnut, several species of oak, hickory, a few sugar maples, a few white and pitch pines, some ash, and the sassafras, all seem to give the country a familiar look. But on the other hand two additional species of *Rhododendron,* the flame-colored *Azalea,* chinquapin, the great number of tulip-trees and magnolias, the *Nyssa, Oxydendron,* Carolina hemlock and other unfamiliar trees, the open forest filled with innumerable unfamiliar flowers or unfamiliar species of familiar genera, such as *Phlox, Lilium, Listera, Habenaria,* etc., emphasizes the difference in one's latitude and keep one's interest awake.

Miss Gertrude S. Burlingham found about the same number of species of *Lactaria* in Vermont and in North Carolina, *i. e.,* 30–35, and about half of this number were common to both.

About 130 species of mosses were collected; of these about 100 are found in Vermont, but many of these 100 differ appreciably from northern forms.

*Hookeria Sullivantii, Entodon Sullivantii, Raphidostigium Novæ-Cesareæ, Pylaisia subdenticulata, Campylopus introflexus, Campylostelium saxicola,* and three species of *Zygodon* were some of the interesting species collected. The moss flora was found to be essentially like that recorded by Mrs. Britton from southwest Virginia, but fifteen to twenty species that she did not find were collected and several common northern forms which she recorded were not met with. The absence of *Polytrichum commune* and *Harpidium* and the abundance of *Entodon, Thuidium* and *Fissidens subbasilans* were very notable.

The open pasture-like mountain summits covered with herbs and some low trees contrasted strongly with the rocky barren ridges of the northern Appalachians, and spruces and firs (*Abies Fraseri*) hardly appear under 5,000 feet altitude.

Marshall A. Howe,
*Secretary pro tem.*

## *Discussion and Correspondence*

### The Status of the Japanese Soft-shelled Turtle

In my "Herpetology of Japan"[1] I raised the question whether the Japanese soft-shelled turtle had been properly united with *Amyda sinensis.* The question had not previously been discussed in any detail by competent authority and based upon adequate material. As the specimens at my command seemed to indicate that these turtles in China and Japan have split up into forms corresponding to the

[1] Bull. 58, U. S. Nat. Mus., 1907, pp. 515–519.

different zoogeographical areas, I considered it the wisest course for the present to keep the synonymies and descriptions of these forms separate, and not being able to make up my mind as to their exact status I left them the usual binominal names by which previous writers have designated them.

My friend, Professor F. Siebenrock, curator in the Naturhistorische Hofmuseum in Vienna, and foremost among students of the Testudinata, has recently, in an article, "Ueber einige, zum Theil seltene Schildkröten aus Südchina,"[2] attempted to show that I did so erroneously ("irrigerweise"). To those unfamiliar with the literature it would appear that I am the first to subdivide the species in question, while, as a matter of fact, I have only doubted the wisdom of some recent authors to lump the forms previously recognized without giving sufficient reasons for so doing. From the way Siebenrock emphasizes that I have separated them into "four distinct species [vier selbständige Arten]," while in his opinion they can not be distinguished even as subspecies, it might be supposed, moreover, that I had been very dogmatic and insistent upon their *specific* distinctness, and it is against this misconception that I pen this protest.

Here is what I said:[3]

> The status of the soft-shelled turtles inhabiting China and Formosa (*A. sinensis* and *schlegelii*), Japan (*A. japonica*) and Amurland (*A. maackii*) has not been worked out for lack of material.

Hereby I indicated that I had not taken any stand as to their specific or subspecific rank, and also that my material was inconclusive and consequently my opinion undecided. I stated, also, further on (p. 516):

> The absence of specimens from the drainage of the Yangtse River, which may be supposed to represent the true *Amyda sinensis*, is particularly to be regretted, as it prevents me from arriving at any but the most inconclusive and preliminary results. That my specimens represent three [not four] separable forms, however, I have but little doubt.

As for the fourth "*form*"[4] I had no personal opinion to offer, never having seen a specimen, and I took great pains to state this plainly (p. 527):

> It is *quite likely* that eventually *A. maackii* may turn out to be the same thing as the Peking form [*A. schlegelii*], in which case that name will take precedence.

Altogether Siebenrock in his rendering of my treatment of these forms makes me use expressions much more positive than the very careful and hesitating words really employed by me. Thus he says: "Stejneger, *l. c.*, p. 518, thinks it is impossible [meint es sei *unmöglich*]" that the two figures quoted "can belong to individuals of the same species [Individuen derselben Art angehören können]," while what I said was simply that "it is not easy to believe that Gray's and Siebenrock's figures represent the same species." Now that Siebenrock has explained the matter by stating that the apparent difference is due to an error of the artist, it is of course "easy to believe."

Siebenrock also states that I "placed the chief weight in distinguishing between my three species [legt das Hauptgewicht bei der Untersuchung seiner drei Arten]" on certain characters, which he then proceeds to contrast in a table of three parallel columns. One who has not seen my book would naturally think that these characters are such as were particularly selected by me to represent constant differences. This is far from being the case. The characters contrasted in the table are culled from my detailed descriptions of three *individuals,* one a four-year-old *male* from Japan, No. 21,179, U. S. N. M.; the other a four-year-old *female* from Formosa, No. 34,055, U. S. N. M.; the third a male in the third year from Tientsin, No. 29,700, U. S. N. M. Siebenrock has evidently taken these descriptions of mine for *diagnoses,* a mistake he could hardly have made if he had studied my book carefully. He would then have seen that they are merely minute descriptions of

[2] *Sitz. Ber. Akad. Wiss. Wien, Math. Naturw. Kl.*, CXVI., Pt. I., December, 1907, pp. 1741–1776.

[3] "Herpet. Japan," p. 515 seq.

[4] I took particular pains in my treatment of these turtles to avoid the terms "species" and "subspecies" as far as possible, and instead used the word "form" in order to particularly emphasize the preliminary character of the whole proceeding.

individuals, and that the weight attributable to the differences shown is discussed elsewhere, viz., pp. 516–519. The "Hauptgewicht," it will then be seen, is placed in my table of comparative measurements on page 516, and even in this case with considerable diffidence, as shown by the following qualification: "Although the series is small, the figures probably deserve some confidence, because of their remarkable uniformity and harmony."

As said above, my material was scant and my conclusions, therefore, preliminary and inconclusive. I have received no *authentic* material since and I am at present as undecided about the real status of these *forms* as I was when I wrote my book. Unfortunately, Siebenrock's treatment has not helped much to clear the matter up. True, he is very positive that there is only one *species* and not even another subspecies ("Selbständige Unterarten," p. 1742, whatever that may mean), and with the great respect I have for him as an authority on the Testudinata and my own inferiority in this field, I would gladly have accepted his dictum, were it not that apparently his and my views as to what constitutes "species and subspecies" are so radically at variance that a discussion would be fruitless.[1]

That Siebenrock completely fails to understand my point of view is plainly shown in the last two paragraphs of his article in which he contrasts *A. sinensis* with *A. cartilaginea* and *A. steindachneri* by the young of the former having symmetrical black marks on the plastron which are lacking in the latter, concluding that inasmuch as there are symmetrical black marks in all of my "four species" ("die vier Arten im Sinne Stejneger's") these can only be individuals of the same original form ("nur Individuen der selben Stammform sein können"). As if I ever had denied that the "forms" I preliminarily recognized by name belong to the same "Stammform"! Of course they do. The question is only, has this "Stammform" in its various geographical areas split up into "separable forms," and this I claim Dr. Siebenrock has failed to disprove. I have shown clearly that the black plastral pattern in the Japanese specimens differs essentially from that described by Dr. Siebenrock himself in Annamese specimens, and yet he maintains that these juvenile markings prove ("beweist") the *identity* of these forms.

That I have used a binominal designation for these, in my opinion, "separable forms" does not mean that I regard them as "selbständige" species. Were I to employ for them trinominals I would thereby have indicated that I knew them to intergrade, but that I did not and do not yet know. Maybe they do. Maybe only 75 per cent. of the specimens from each geographical area can be told apart. But if 75 per cent. of the Japanese specimens can be shown to be different from 75 per cent. of the Chinese specimens I shall be satisfied for my zoogeographical purposes to regard them as "separable forms" and to recognize them nomenclatorially. Whether that be binominally or trinominally is at present immaterial.

Leonhard Stejneger
U. S. National Museum,
Washington, D. C.,
April 2, 1908

[1] This is pretty well illustrated by the way in which he takes me to task for not recognizing *Geoclemys reevesii unicolor* (*l. c.*, p. 1760), as a subspecies ("Unterart"), claiming that I regard the "more or less uniform black specimens" as "individuelle Aberrationen." I have not committed myself on that point. To me these specimens represent either a color phase of a dichromatic species, or they are simply more or less melanistic individuals, but I do not know which, and for my purpose it matters little whichever they are. It is admitted that these specimens are found wherever the typically colored *G. reevesii* is found, and color varieties not geographically separated I do not recognize *nomenclatorially*. At any rate, they are not *subspecies* in the modern and commonly accepted meaning of the word.

## AN OLD STORY

We are still struggling with variations of the old discussion with which some of our teachers tormented our boyhood days. Did Niagara Falls roar before the country near it was inhabited? We still hear it asserted that space would not exist if we were so situated that we were ignorant of its properties. Space

is a relation between points. If we had no fixed or relatively fixed datum points, to serve as origins, and to enable us to establish direction lines, we are assured that there would be no space. We should not be able to move if there were nothing for us to bump against. We discover a certain tree in a pathless forest which no foot had trodden before. It has rings of growth and a magnitude which indicate that it must have had a history before it ever came into the thought of man. But its existence dates from its first discovery. It was pure nothingness before.

Let us imagine some unfortunate floater to have spent his life in solitude on a raft in mid-ocean. The water is smooth, the winds are at rest and the sky is continually overcast with a uniform layer of clouds. This we are to assume will involve the conclusion that latitudes and longitudes and compass directions do not exist. The fact that there are other philosophers in Paris who have enjoyed advantages which the floater has not enjoyed must not be considered.

If some of our philosophically inclined brothers would spend a little more time in defining the sense in which they are using words, and a little less time in the futile attempt to define things, the atmosphere would seem clearer. The youthful floater would be somewhat less at sea.

FRANCIS E. NIPHER

### THE SATELLITES OF MARS

TO THE EDITOR OF SCIENCE: The letter of Professor Eastman in SCIENCE, No. 695, is my only excuse for taking your valuable space. In consequence of Professor Eastman's letter to the editor of the *Transcript*, there was printed in the paper this explanation: "In the account of the work of Professor Hall presented in the *Transcript* at the time of his death, reference was made to the discovery of the satellites of Mars as 'accidental.' Although the discovery did belong to the class of the accidental because it was unpredictable, still the hastily-chosen word does not describe the conditions upon which the discovery was based. The exact term is a little difficult to catch, speculative and tentative describing in a way the methods by which the observations were carried forward to success."

This note prefaced half-a-column of extract from Professor Newcomb's "Reminiscences" on the same discovery, and together they formed an article that one would not be expected to overlook. Being no longer "live" news, the article was not published till December 21.

With reference to the companions of Procyon seen at the observatory, it was simply the current gossip of the astronomers of the time, fifteen or twenty years ago, lingering in my memory. It illustrated the splendid, sterling qualities of Professor Hall better than any other story that recurred to me during the hurried preparation of the article. It is very good of Professor Eastman to set the world right in the matter, to place the discovery of the fictitious companions where it belongs and to assure us that this bit of gossip has, what most gossip lacks, a foundation.

JOHN RITCHIE, JR.

## SPECIAL ARTICLES

### COINCIDENT EVOLUTION THROUGH RECTIGRADATIONS AND FLUCTUATIONS (THIRD PAPER[1])

I PUBLISHED recently the statement of a law which I believe to be fundamental in the evolution of organisms, namely, "The Law of the Four Inseparable Factors."[1] It is expressed as follows:

*The life and evolution of organisms continuously center around the processes which we term heredity, ontogeny, environment and selection; these have been inseparable and interacting from the beginning; a change introduced or initiated through any one of these factors causes a change in all.*

[1] "Evolution as it Appears to the Paleontologist," SCIENCE, N. S., Vol. XXVI., No. 674, November 29, 1907, pp. 744–749. (First paper.)

"The Four Inseparable Factors of Evolution: Theory of their Distinct and Combined Action in the Transformation of the Titanotheres, an Extinct Family of Hoofed Animals in the Order Perissodactyla," SCIENCE, N. S., Vol. XXVII., No. 682, January 24, 1908, pp. 148–150. (Second paper.)

I have added two corollaries from my studies on the titanotheres, in which it appears to be highly probable that in different parts of the body of highly complex vertebrated animals, different evolution factors may be operating coincidently to produce a coordinated adaptive result, namely:

*First, that while inseparable from the others, each process may in certain conditions become an initiative or leading factor; second, that in complex organisms one factor may be initiative in one group of characters while another factor may at the same time be initiative in another group of characters, the inseparable action bringing about a continuously harmonious result.*

In a recent paper before the Zoological Society at New Haven these corollaries were illustrated in the evolution of the titanotheres, as shown in the accompanying Figs. 1, 2 and 3.

### 1. *Selection of Fluctuations*

It is observed that in four or five contemporaneous phyla of Middle Eocene titanotheres, unquestionably derived from a common lower Eocene ancestor, there is a tendency to diverge into *brachycephalic* forms (Fig. 1, *A, Palæosyops*) and *dolichocephalic* forms (Fig. 1, *C, Dolichorhinus*); the former become increasingly brachycephalic, the latter become increasingly dolichocephalic. This change of proportion is brought about as follows: (1) there is a redistribution of materials, (2) this effects a change in the entire proportions of the skull, (3) the different component bones are affected differently, because there are *distinct percentages of increment,* in breadth or in length, in the bones of each region.

*First Experiment, Redistribution* (*Fig. 1*). This proves that a general redistribution of materials will convert a brachycephalic into a dolichocephalic type. I outline the broad

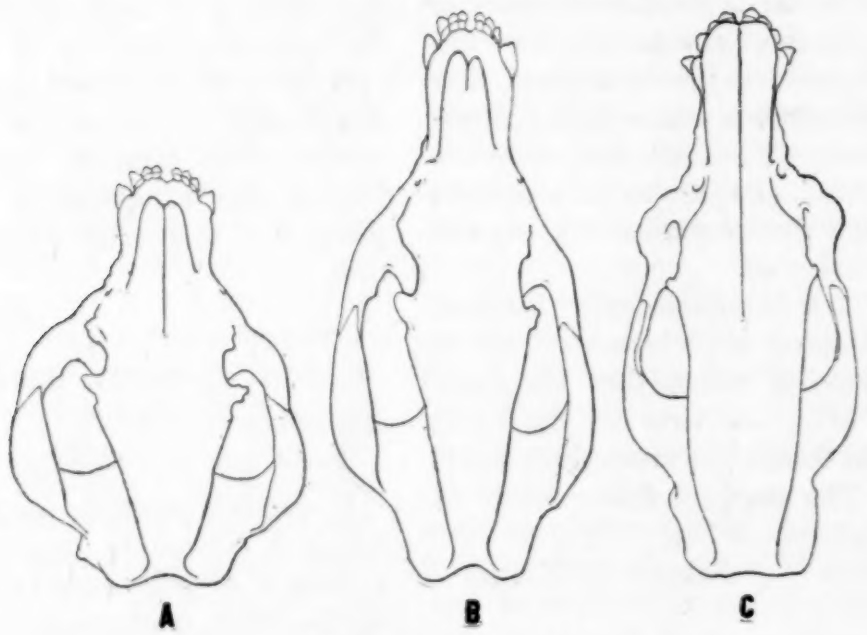


Fig. 1. Artificial Dolichocephaly.
*A, Palæosyops,* extreme brachycephalic type.
*B,* outline produced artificially by stretching *A* to length of *C.*
*C,* extreme dolichocephalic type, *Dolichorhinus.*

skull of *Palæosyops* on a sheet of India rubber and stretching the sheet lengthwise, produce the Fig 1, *B,* thus artificially creating a skull of dolichocephalic type which approximately resembles Fig. 1, *C.* This experiment illustrates what may be done by a mere redistribution of materials.

*Second Experiment, Redistribution* (*Fig. 2*). This illustrates progressive dolichocephaly. Here are represented the outlines derived by stretching and slightly expanding the skull of

a dolichocephalic animal into that of its still more long-skulled descendant. Fig. 2, *A*, represents the palatal view of a skull which is ancestral to the second skull represented in Fig. 2, *C*. An outline of the skull represented in Fig. 1, *A*, is traced on India rubber and stretched into the outline represented in Fig. 2, *B*, which it is seen gives us an approximate approach to Fig. 3, *C*.

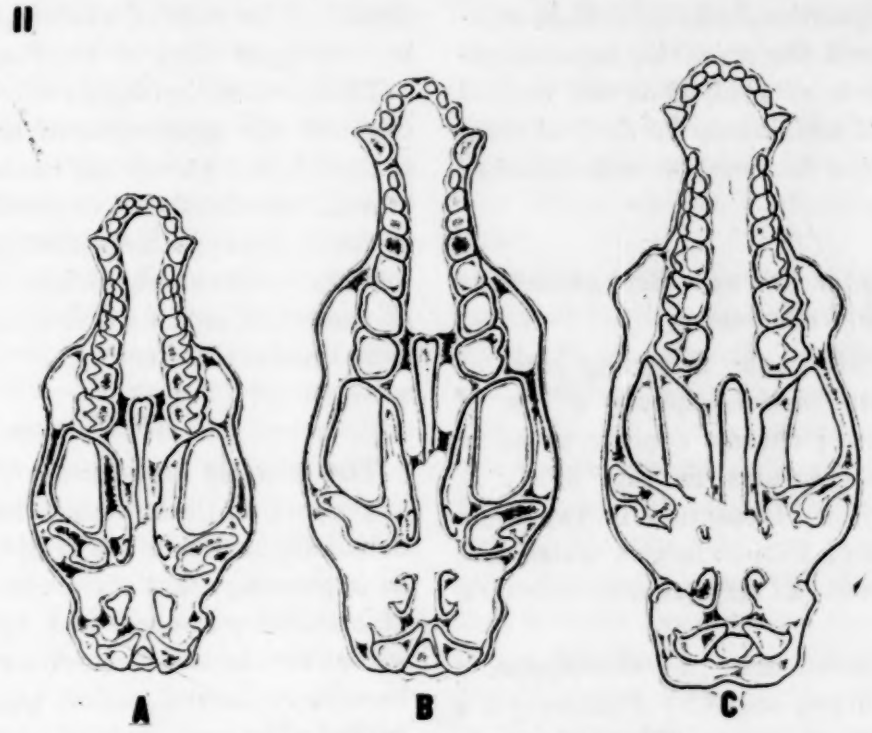


FIG. 2. Artificial Dolichocephaly.
*A*, a skull ancestral to *C*.
*B*, outline produced artificially by stretching *A* to length and width of *C*.
*C*, extreme long-skulled type, *Dolichorhinus*.

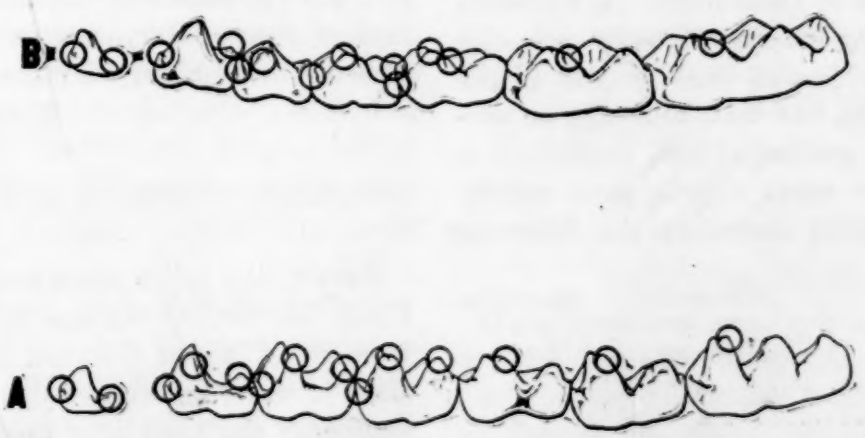


FIG. 3. Rectigradations. *A*, *Orchippus*, Middle Eocene horse; *B*, *Palæosyops*, Middle Eocene titanothere. The circles indicate new cuspules rising independently in these two phyla.

The above two experiments prove that transition from brachycephaly to dolichocephaly or from dolichocephaly to an intensified dolichocephaly may be interpreted partly as a mere redistribution of materials, all parts being stretched in the same proportion. *But this does not describe all that actually occurs in nature, because in skull lengthening or shortening each bone is affected somewhat differently.*

I am inclined to regard dolichocephaly and brachycephaly in the vertebrates generally as caused by the natural selection of fluctuations

in a broad-skulled or long-skulled direction, respectively.

The important point to note is that the descendants of a single ancestral titanothere or of any other vertebrate may become either brachycephalic, mesaticephalic or dolichocephalic; in other words, *the primitive mesaticephalic ancestral form of skull does not control the form of skull which may be derived from it, yet an evolution tendency once established is pursued to its limits.*

### 2. *Tooth Evolution through Rectigradations or Orthogenesis*

Here, in contrast to the foregoing cases of brachycephaly and dolichocephaly a law of hereditary ancestral control appears to be in operation. The diagrams in Fig. 3, *A, B,* represent the origin of cuspules in two independent families of Perissodactyla which also have sprung from a very remote common ancestor.

The types selected are (*A*) *Orohippus,* a Middle Eocene horse, and (*B*) *Palæosyops,* a Middle Eocene titanothere. The teeth represent the seven grinders of the lower jaw viewed from the internal aspect. Circles surround the new cuspules, which are appearing on the inner sides of these teeth. We observe that cusp for cusp exactly the same cuspules are arising in the jaw of *Orohippus* as in the jaw of *Palæosyops,* but that, although an animal of the same geological age, *Orohippus* is acquiring its new cusps a little more rapidly than *Palæosyops,* as shown in the following table:

| | Palæosyops No. of Cuspules | Orohippus No. of Cuspules |
|---|---|---|
| First premolar | 2 | 2 |
| Second premolar | 2 | 3 |
| Third premolar | 3 | 4 |
| Fourth premolar | 4 | 4 |
| First molar | 3 | 3 |
| Second molar | 1 | 1 |
| Third molar | 1 | 1 |
| Total | 16 | 18 |

This comparison proves that while there is apparently a law of ancestral or hereditary control operating in the genesis of these new cusps, and that while the new cusps are orthogenetic and hence may be termed "rectigradations" (because developing in fixed lines) *such law of ancestral control does not determine the rate of evolution of the cusps in these two types.* The *rate* of evolution is more rapid in *Orohippus* than in *Palæosyops.*

This observation appears to bar the hypothesis that the appearance of these cusps is due to an internal perfecting tendency which operates independently of external conditions and to favor the hypothesis that in some unknown manner external conditions control the rate of evolution, again illustrating the law of the four inseparable factors.

### *Conclusion*

The contrast between the origin of changes of proportion illustrated in brachycephaly and dolichocephaly and the origin of new cuspules is, apparently, that the former is independent of hereditary control and not predetermined, while the latter is predetermined or under hereditary control. Both phenomena are controlled alike as to *rate of evolution* by adaptation to external conditions, namely, by the kind of food on which the animal subsists.

These considerations appear to me to sustain my hypothesis of the independent operation of two primary factors at least to produce an harmonious adaptive result.

Henry F. Osborn

## THE FILLING OF EMERALD LAKE BY AN ALLUVIAL FAN

About four miles northwest of the town of Field, in British Columbia, and separated from it by Mount Burgess, lies the beautiful sheet of water known as Emerald Lake. Situated near the head of a broad glacial valley, this lake has been formed probably by the damming of the original channel by a heap of glacial débris, perhaps supported by a resistant outstanding ledge of bed rock at this place. Across this barrier the water has its exit.

The present interest in Emerald Lake, however, rests not so much upon its mode of formation as upon the fact that it is slowly being

filled in at its northern end by a large alluvial fan. Since the streams which feed the lake have their source in the snow and ice fields high up on the adjacent mountains, they are loaded with a considerable supply of rock waste, which, by reason of their swift descent down the steep mountain slopes, they can easily wash into the valley. But as soon as the water reaches the much gentler grade of the valley floor, a great deal of the material, which is too heavy to be borne farther, is dropped, the coarser near the foot of the cascades, the lighter at some distance. In spring, when the volume of the rivers is much increased, coarse fragments are swept farther down the valley than they are in the summer season. Furthermore, after the stream has raised its bed in one place, a freshet may cause it to break through its low walls and begin building in a new direction. Evidence of this swinging of the stream is abundant on the surface of the Emerald Lake fan, in the numerous forsaken channels that radiate from its feeding point, or origin.

The construction of the fan is carried on by *two* streams which unite near the head of the lake. That the west branch is the more efficient is proved by the fact that the east branch flows through a narrow marshy tract bounded on the east by the steep valley walls and on the west by the edge of the fan of the west branch. In other words, the latter has shoved the east branch against the eastern valley walls. Furthermore, the east stream has, near the base of its cascades, a small fan of its own.

There is no doubt, then, that the main fan is growing. At what rate this development is going on is not certain; but it must be relatively rapid, for, although trees of twenty or thirty years are found on many parts of the deposit, especially in the older portions, these are generally rather thinly scattered. Vegetation is scarce because there has been little or no rock decay.

Emerald Lake was described above as occupying a depression near the head of a glacial valley. We may add that the fan is in the northern half of this depression; that is, the lake and the fan together are situated in a single basin. This is very evident in the field, where the continuity of the bounding walls of both fan and lake is most conspicuous.

The northern border of the lake is marshy because the finer sediments of the fan are laid down here. Farther back these are being covered by coarser sand and pebbles. Hence a vertical section through the fan would be that of a typical lake basin, for in vertical succession the strata run from fine below to coarse above.

There are five facts, therefore, which indicate that the lake is being filled in by the fan. They are as follows: (1) the surface of the fan is dissected by channels of *recent* formation; (2) the weaker stream has been pushed against the valley wall; (3) the deposits are fresh, and the vegetation is consequently sparse; (4) the lake and the fan are in the same depression; and (5) the structural relation between the lake and the fan is that of a filling lake basin. The first three statements denote recent change, while the last two refer to the close connection between the sites of the water and of the sediments. To-day Emerald Lake appears to be about half its original size. How soon it will be crowded out of existence it is impossible to determine; but that it must eventually disappear, unless some unforeseen event occurs, seems inevitable.

FRED. H. LAHEE
HARVARD UNIVERSITY

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## *BOTANICAL NOTES*

### SEASIDE LABORATORY WORK

THE combination of recreation with study is so difficult in many places that it often seems an act of cruelty to urge tired teachers to engage in study during summer vacations. We work too hard for eight or nine months, so that rest of some kind is often absolutely necessary in order to avoid brain fag. No doubt it would be a wiser plan in schools and colleges for both students and teachers to work at a more leisurely rate, and to keep it up the whole year, as is done in other occupations, but as schools are conducted at the present time teachers and

students are pretty well fagged out by the beginning of the summer vacation, and there is imperative need of rest. In spite of this, many teachers find it necessary to add to their stock of knowledge during the vacation, and so they flock to the summer schools, and add six or eight weeks of strenuous work to their school year of teaching. No wonder that so many teachers, especially in the high schools, so soon acquire the look that we recognize as the "teacher's face." The wonder is that more of them do not break down mentally and physically.

When Agassiz thirty-five years ago started the Penikese summer school he did more than any one then thought for the tired teachers of the country, for he showed them how they might rest and study at the same time. He showed them that "better way" of finding out about nature and all the world of living things. His secret was the simple one of learning of nature by being in it, of learning about the world of living things by becoming a part of that world of life. And this was the beginning of the out-of-doors schools in America. In these new schools, instead of trying to bring mutilated fragments of nature into the laboratory the student lives in the forests, fields and meadows, with the birds, insects and plants. He lives much in the open, wandering through the fields and woodlands, searching the brooks, rowing over the ponds and bays, always with nature, because always in nature. And at the end of his vacation school he returns to his teaching refreshed and strengthened in body and mind, and with a satisfying store of knowledge about the woodsy things, and the creatures of the swamps and ponds.

Such a vacation school is that at Cold Spring Harbor, on the north shore of Long Island, thirty miles eastward from New York City. For eighteen years it has annually welcomed those who came to it for rest and study, and this year it invites such again to come (during July and August) to its shady woodlands, its bogs, its fresh ponds, and its salt-water basins and bays, all full of the life that thrives in such environment. Here one may study birds, comparative anatomy of animals, embryology, bionomics and evolution. Here too, the student may acquaint himself with the world of lower plants, from the tiny water forms to the fungi, the lichens, the mosses and the ferns, up to the flowering plants. For these living things are all about him, and he has but to observe them where they grow, or take them to the near-by laboratory where with microscopes and books he may study them more critically.

For twenty years the Marine Biological Laboratory at Woods Holl, on Buzzard's Bay, Mass., has afforded facilities for seaside study. In the waters of the bay and its varied shore line, including points and flats of many kinds, extending out to Vineyard Sound and across to the shores of Marthas Vineyard, added to the fresh-water ponds and lakes on the mainland, the student may find a world of aquatic life, while in the woodlands, which in many places still linger from the time when the region was covered with forests, terrestrial life of all kinds may be found in abundance. In the laboratory are provided botanical courses of instruction in algae, fungi and the higher plants, and zoological courses in lower animals, embryology and comparative physiology. The fact that it is only fifteen miles from the laboratory to Penikese Island where Agassiz started the first seaside summer school should add interest to this place for vacation study.

Much like the preceding is the Lake Laboratory at Cedar Point, near Sandusky City on Lake Erie, which for the past few years has offered similar facilities for those living so far away from the ocean as to practically prohibit so long a journey. Here also are offered facilities for studying animals and plants in the forests, in the open or in the ponds and bays, while in the laboratory are more formal studies of the embryology, morphology and comparative anatomy of animals, and the more technical lines of general botany.

If you are tired out at the end of the school year, and yet feel that you must study, go to Cold Spring Harbor, or Woods Holl, or Cedar Point, and rest while you imbibe something of what nature can teach you when you come closely in contact with her.

### PHILIPPINE TIMBERS

NOT long since a notice was made in SCIENCE (March 13, 1908) of F. W. Foxworthy's paper on Philippine Woods published in the *Philippine Journal of Science.* Now we have another paper on the same subject published as Bulletin No. 7 by the Bureau of Forestry of the islands, and entitled "A Preliminary Check-list of the Principal Commercial Timbers of the Philippine Islands" prepared by Dr. H. N. Whitford, the chief of the Division of Forest Investigation. This list differs from the former in giving more attention to the systematic arrangement of the species and their distribution as indicated by actual specimens in the herbarium of the Bureau of Science in Manila, while it gives much less attention to the structural and physical properties, and uses of their wood. The purpose of the list is to show what is actually known as to the timber trees of the islands, so that additions and corrections may be made more easily. As in the former list the common names used in different parts of the archipelago are recorded, and one of these is selected for each species as the one most widely used, and therefore the approved name for general use.

The twenty-six families which are represented by somewhat more than eighty species are arranged according to Engler and Prantl's system in the Natürlichen Pflanzenfamilien. The families Leguminosae, Dipterocarpaceae, Combretaceae and Sapotaceae contain the larger numbers of species; in fact these four families include nearly one half of the known species. There is but one species of Pinaceae, viz.: *Pinus insularis.* A good index completes the pamphlet.

### ANOTHER TREE BOOK

THE Philadelphia publishing house of Lippincott Company has just brought out a book which must prove very useful for students and tree-lovers everywhere. It bears the title of "Our Trees: How to know Them," and is the joint work of Arthur I. Emerson and Dr. Clarence M. Weed. The book consists of large photographs which have been very well reproduced in the full-page plates, and in each case a page of non-technical text. Each photographic plate includes the flowers, fruits, twigs and leaves on a larger scale, and at the side a view of the tree on a much smaller scale. The text includes a popular but accurate description of the tree, its bark, foliage, fruit and something of its uses. Its range of natural distribution is usually given, and in some cases suggestions are made as to its ornamental value. In the sequence of families and the generic and specific nomenclature the authors follow Sargent's "Manual of the Trees of North America." The book must prove to be a valuable addition to the library of every man who is interested in trees.

### A SECOND ORCHID BOOK

THREE years ago the present writer had the pleasure of reviewing favorably in this journal (SCIENCE, May 19, 1905) the first volume of Oakes Ames's "Orchidaceae," and now the second volume, which has just been received, calls for a notice. This one opens with a five-page introduction in which the author discusses the part of Engler's "Das Pflanzenreich," which deals with *Orchidaceae,* protesting vigorously against the treatment which his writings and drawings received at the hands of the editors of that work. Then follow half a dozen short articles before reaching the principal paper of the volume, "Studies in the Orchid Flora of the Philippines," covering 242 pages. Following this are fifteen pages devoted to new species and names of American orchids, and the volume closes with a generic and specific index to volumes I. and II. Nine full-page plates and many text illustrations, all very good and satisfactory, are scattered through the book. As in the preceding volume, all original descriptions (and many others) of species are in Latin, as is quite proper in a work of this kind, although the general discussions as well as the keys are in English. In many cases the Latin description is followed by an English translation. The paper used in the book is of fine quality, and the typography and presswork of the best. The author is to be congratulated upon bringing out a second volume so soon after the first, and it is to be

hoped that he may be encouraged to continue this admirable series. It is particularly creditable to American botany.

SHORT NOTES ON BOTANICAL PAPERS

Dr. P. A. Rydberg's "Scandinavians who have contributed to the Knowledge of the Flora of North America" (Augustana College Library Publications, No. VI.) is a valuable contribution to the history of botany in this country. This comes quite opportunely at this time when there is a distinct revival of interest in everything pertaining to the history of botany, due no doubt to the celebration last year of the two-hundredth anniversary of the birth of Linné. In treating the subject Dr. Rydberg recognizes eight historical periods, viz.: the Medican (A.D. 1478–1601) in which there were no Scandinavian contributors to the flora of North America; the Bauhinian (1601–1694) again with no contributors; the Tournefortian (1694–1735) with two contributors; the Linnean (1735–1789) with eleven Scandinavian contributors; the Jussieuan (1789–1819) with eight; the Candollean (1819–1840) with twelve; the Hookerian (1840–1889) with forty-three; the Englerian (1889–) with thirty-two. These botanists, of whom there were one hundred and eight, are divided by nationality as follows: Danes, 51; Swedes, 43; Norwegians, 9; Finns, 5. Short biographies are given of each, with lists of their principal works bearing on the flora of North America.

The Annual Report of the Director of Botanical Research in the Carnegie Institution (Dr. D. T. MacDougal) for 1907 contains brief accounts of the lines of work carried on during the year. Among the titles are "The Advance and Recession of Vegetation in the depressed Basins of the Colorado Delta," "Acclimatization," "Distribution and Movements of Desert Plants," "The Topography of Chlorophyll Apparatus," "Physiology of Stomata," "Evaporation and Plant Distribution," "The Relation of Evaporation to Plant Activity." An automatic rainmeter is described, and mention is made of the explorations and field work undertaken, the studies of desert conditions, bibliographical and cooperative work, equipment, etc., and the report closes with a list of the laboratory publications of the year, including thirteen titles. This work was provided for by a grant of $25,000, and was practically all done at the Desert Laboratory at Tucson, Arizona. The report includes a map of the Colorado River delta, a half-tone view of the laboratory, and two views of portions of the Salton Sea. Every botanist will be glad to note that the work undertaken is of the highest scientific value, and the trustees of the institution are to be congratulated upon their selection of so able a director of the botanical work.

The United States National Herbarium has begun the publication of a series of papers by Mr. William R. Maxon under the title of "Studies of Tropical American Ferns," the first of which has just appeared as part 7 of volume X. of the "Contributions" from the Herbarium. This part is pretty largely taken up with attempts of the author to bring order out of the confusion into which many of the species have fallen. One new genus, a new name for another genus and several new species are the additions proposed in this part. Two good plates illustrate some of these additions. The continuation of this series will be watched with interest by fern students everywhere.

The closing number (December, 1907) of the *Philippine Journal of Science* (Botany) contains notes on an early collection of ferns, a revision of *Tectaria* (by E. B. Copeland), descriptions of two new grasses (by E. Hackel), some additions to the flora, further identifications of some of Blanco's species, and further titles for the index of Philippine botanical literature (by E. D. Merrill).

Another part (vol. 9, part 2) of the North American Flora has come to hand, completing the Family *Polyporaceae* (by M. A. Murrill). Part 1, which appeared in December, 1907, covered the first half of this family, and included the key to the tribes and genera, and descriptions of the genera and species from *Hydnoporia* (No. 13) to *Laetiporia* (No. 46), while this part begins with *Phaeolopsis* (No. 47) and closes with *Cycloporus* (No. 78). An

examination of these pages shows one who has known something of the pore fungi that he will have many new names to learn, since the old genera, as *Polyporus, Daedalea, Lenzites, Trametes,* etc., have been split up into new ones.

If there are any plants about whose nomenclature there has been no doubt, the common alfalfa of the fields is one of them. We all felt that we were on solid ground when we wrote its name *Medicago sativa* of Linné, but now comes C. S. Scofield, of the United States Department of Agriculture, who offers strong reasons for abandoning this name. It appears that Tournefort in 1700 figured "luserne" quite correctly under the name of *Medica,* and also a very different plant on the same plate under the name of *Medicago.* Linne made use of Tournefort's plate and descriptions, at first (in the "Systema Naturae," 1735) accepting his names, but later (in the "Species Plantarum," 1753) applying the name *Medicago* to both plants in the plate. It appears from this that *Medicago* must be retained for the second plant on the plate (*M. radiata*), and that the proper name of the alfalfa ("luserne") is *Medica sativa* (L.) Mill.

G. H. Powell, of the Bureau of Plant Industry of the United States Department of Agriculture, has published (in Bulletin 123) the results of his studies of the decay of oranges while in transit from California. He finds that it is principally due to a blue mold (*Penicillium digitatum*), although a part of it is caused by *P. glaucum.* He finds, further, that the fungus is incapable of penetrating unless the skin has been injured in some manner. Cooling the fruit before shipment and the maintenance of a cool temperature in transit tend to reduce the amount of decay. The report is illustrated by nine full-page plates, two of which are colored.

Experiments by Dr. G. G. Hedgcock extending through five years seem (Bulletin 131, Bureau of Plant Industry, U. S. Department of Agriculture) to prove that the disease of the roots of the almond, apricot, blackberry, cherry, peach, plum, prune and raspberry known as "crown gall" is essentially identical, and due to the same organism. Furthermore, it has been found possible to produce ("with great difficulty") a crown gall on the apple, chestnut, walnut and rose by transfer of the organisms from the galls on the first named plants. The author says, further, "these results show quite conclusively that apple crown gall in its soft form is contagious, but that in the hard form it is either slightly or not at all contagious."

CHARLES E. BESSEY
THE UNIVERSITY OF NEBRASKA

## *HARVARD ANTHROPOLOGICAL SOCIETY*

THE Harvard Anthropological Society celebrates its tenth anniversary in May of this year. The club was founded in 1898 mainly through the initiative of the late Dr. Frank Russell and Mr. Walter S. Andrews. Its object "is the promotion of interest in the study of the natural history of man and of the history of human culture with special reference to its origins and primitive forms and to the general laws of its development."

The society is composed of undergraduates and graduates of Harvard University who are taking or have taken courses offered by the department of anthropology. The officers, with the exception of the permanent secretary, are elected from the student body. Meetings open only to members of the club are held every month during the college year, at which time papers are presented and discussed. The society thus furnishes a means of intercourse between the older and younger men which is not possible in any other way.

During the first seven years of the history of the organization two or more public lectures were given under the auspices of the society each year. A different policy has been carried out during the last three years. Two dinners have been held annually with a special guest of honor who has delivered an address. These occasions have proved most profitable as well as enjoyable as many former members of the club have returned.

The society numbers among its honorary members Professor F. W. Putnam, Miss Alice Fletcher, Mr. C. P. Bowditch, Professor Franz

Boas and Professor A. C. Haddon. Among the speakers at the meetings of the club have been, in addition to the honorary members, Professor A. M. Lythgoe, Professor George F. Moore, Professor Leo Wiener, Professor A. L. Kroeber, Professor Marshall H. Saville, Mr. Stewart Culin, Professor E. H. Nichols, Dr. J. M. Bell, Professor John Murdock, Professor G. H. Chase and Mr. E. B. Drew.

ALFRED M. TOZZER

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## *SCIENTIFIC NOTES AND NEWS*

ON the death of W. S. Yeates, the late state geologist of Georgia, Professor S. W. McCallie, for a number of years the senior assistant geologist of the survey, was appointed state geologist. S. P. Jones, some years back assistant state geologist, who has recently been doing special work in petrography at the University of Wisconsin and at the Shetfield Scientific School, at Yale University, has been appointed assistant state geologist. The staff of the survey now consists of S. W. McCallie, state geologist; Otto Veatch, assistant state geologist; S. P. Jones, assistant state geologist, and Edgar Everhart, chemist.

THE British home secretary has appointed R. A. S. Redmayne, M.Sc., professor of mining in Birmingham University, to the newly-created post of chief inspector of mines.

DR. FRIDJOF NANSEN has retired as Norwegian Ambassador to Great Britain.

THE fiftieth anniversary of Dr. S. E. Chaillé as teacher in the medical department of Tulane University will be celebrated by the alumni on May 19. It is the intention to establish a memorial fund for the endowment of a chair of physiology or hygiene to be named after Dr. Chaillé.

PROFESSOR A. LAWRENCE ROTCH, founder and director of the Blue Hill Meteorological Observatory, has been elected an honorary member of the Royal Meteorological Society of London.

AT the annual general meeting of the American Philosophical Society, Philadelphia, held on April 23, 24 and 25, new members were elected as follows: Martin Grove Brumbaugh, Philadelphia, superintendent of public schools; Walter Bradford Cannon, Boston, Mass., professor of physiology in Harvard University; James Christy, Philadelphia, consulting engineer; William Hallock, New York City, professor of physics in Columbia University; Edward Washburn Hopkins, New Haven, Conn., professor of Sanskrit and comparative philology at Yale University. Leonard Pearson, Philadelphia, dean of the faculty of veterinary medicine in the University of Pennsylvania; Josiah Royce, Cambridge, Mass., professor of the history of philosophy in Harvard University; Jacob G. Schurman, Ithaca, N. Y., president of Cornell University; Charles Henry Smyth, Princeton, N. J., professor of geology at Princeton University; Herbert Weir Smyth, Cambridge, Mass., Eliot professor of Greek literature in Harvard University; Henry Wilson Spangler, Philadelphia, professor of mechanical engineering in the University of Pennsylvania; Edward Anthony Spitzka, professor of general anatomy at Jefferson Medical College, Philadelphia; John Robert Eitlington Sterrett, Ithaca, N. Y., professor of Greek language and literature, Cornell University; Richard Hawley Tucker, Mount Hamilton, Cal., astronomer in the Lick Observatory; Robert Williams Wood, Baltimore, professor of experimental physics in Johns Hopkins University. As foreign members were elected: Ernest Nys, Brussels, judge of the Court of Appeals and professor of law in the University of Brussels; Albert F. K. Penck, Berlin, professor of geography in the University of Berlin.

A SOLUTION of the difficulty caused by the interference of summer teaching with professional investigation is suggested by the instructors in the department of geology and geography at Harvard, who announce in the pamphlet lately issued by the Harvard Summer School of Arts and Sciences that they will receive properly qualified students in connection with the various studies that they propose to undertake themselves. Field work in historical and structural geology in Mon-

tana is offered by Dr. G. R. Mansfield; geological or petrographical studies in Montana or New England, by Professor J. E. Wolff; physiographic studies in central France, by Professor D. W. Johnson; physiographic field work in northern Italy or southern Switzerland, by Professor W. M. Davis; and geological field work in Brazil, by Professor J. B. Woodworth. The several instructors named may be addressed regarding their plans of work.

DR. CHARLES A. KOFOID, associate professor of histology and embryology in the University of California and assistant director of the San Diego Marine Biological Laboratory, has been granted leave of absence and will spend the coming academic year in Europe, principally at Munich and Naples. He will deliver a course of lectures in June at the University of Liverpool on "The Plankton" and an address at London before the Challenger Society of Great Britain on "Oceanography in America."

PROFESSOR JOHN M. MACFARLANE, professor of botany in the University of Pennsylvania, has returned from a collecting trip in the Gulf states.

PROFESSOR DAVID G. LYON, curator of the Semitic Museum of Harvard University, has left Cambridge for Samaria, where he will take charge of the excavations to be carried on under the auspices of the museum.

SIX members of the department of geology at the Oklahoma State University are doing field work this summer. Professor Gould, with S. S. Hutchinson and R. R. Severn, is studying air and gas problems in the eastern part of the new state. He will prepare a report on the subject to be published by the Oklahoma Geological Survey. Professor E. G. Woodruff, accompanied by J. W. Montgomery and E. S. De Galyer, is with N. H. Darton in Wyoming, working for the U. S. Geological Survey.

THE tenth and last lecture in the Harvey Society course will be delivered at the New York Academy of Medicine building on Saturday, May 9, at 8:30 P.M., by Professor A. E. Schäfer, of the University of Edinburgh. Subject: "Artificial Respiration in Man." Professor Schäfer, who has come to the United States for the purpose of giving the Herter lectures at the Johns Hopkins Medical School, was chairman of a committee appointed by the Royal Medical and Chirurgical Society to investigate the phenomena attending death by drowning and the means of promoting resuscitation in the apparently drowned. His lecture will embody the results of much practical work on the subject of artificial respiration.

PROFESSOR CHARLES H. JUDD, of Yale University, will be one of the lecturers in the new department of psychology and pedagogy which is to be given at Chautauqua this summer. Among other special courses in the summer school is one in physical education by Dr. J. W. Seaver.

SIR WILLIAM RAMSAY delivered on April 11, at the Electro-Technical Institute, Vienna, a lecture on radio-active gases. After tracing the history of the discovery of argon, krypton, neon and xenon, the lecturer demonstrated the scientific importance of the emanation of radium, and expressed once more his gratitude for the gift of radium which he received some time since from the Austrian Academy of Sciences. The lecture was followed by a reception in honor of Sir William and Lady Ramsay.

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## *UNIVERSITY AND EDUCATIONAL NEWS*

THE new buildings of the College of the City of New York will be formally dedicated on May 14, when addresses will be made by Mayor McClellan, of New York City, and President Eliot, of Harvard University. In the afternoon the didication of the Chemistry and Mechanical Arts Buildings takes place. Professor Charles Baskerville, director of the department, will preside at the dedication of the building for chemistry, the program of which is as follows:

"A Pioneer of Chemistry," by Edgar F. Smith, vice-provost of the University of Pennsylvania.

Unveiling of portrait of Wolcott Gibbs, Ph.D., the first professor of chemistry, 1848–64.

"Some Changes in Chemistry in Fifty Years,"

Ira Remsen, '65, president Johns Hopkins University.

Unveiling the portrait of R. Ogden Doremus, LL.D., second professor of chemistry, 1864–1903.

"The Future in Chemistry," by Wilder D. Bancroft, professor of physical chemistry, Cornell University.

"The College Course and Practical Affairs," H. Nichols, president of the General Chemical Company.

"Chemistry and the Municipality," by Herman A. Metz, comptroller of New York.

Formal opening of the building by Edward M. Shepard, chairman board of trustees.

At its recent session the legislature of New Jersey appropriated $20,000 for furnishing and equipping the new engineering building which is being erected for Rutgers College.

All but $5,000 had been contributed toward a fund of $100,000 for Sewanee University required by Mr. Andrew Carnegie as a condition of his gift of $60,000.

At their last monthly meeting the regents of the University of Michigan resolved to apply for admission to the benefits of the Carnegie Foundation for the Advancement of Teaching.

The *Electrical World* says: "A meeting of alumni of the Brooklyn Polytechnic was held last week to protest against what has been charged as mismanagement of the institute. Since 1899, when Henry Sanger Snow, the missing ex-treasurer of the New York and New Jersey Telephone Company, became president and radical changes were introduced, some alumni say that the school has run up a deficit of $268,989, while before it had been self-sustaining. The borrowing capacity of the institution has now been reached, as its indebtedness is $400,000. Abandonment of the arts course, first suggested by Snow, is particularly opposed by the alumni."

Dr. Frank K. Sanders, of Boston, formerly dean of the Divinity School at Yale, and now executive head of the Congregational Publication Society of the United States, has been elected president of Washburn College, Topeka, Kansas.

Dr. William H. Warren, professor of chemistry in the Medical Department of Washington University, St. Louis, Missouri, has been appointed dean of that institution.

Dr. John W. Bradshaw has resigned as registrar of the literary department of the University of Michigan. He will continue in the department of mathematics. The position of registrar will be filled by Professor Arthur G. Hall, of Miami University, who will be an instructor in mathematics and editor of the *Bulletin*.

At the recent meeting of the regents of the University of Nebraska, Professor F. D. Heald presented his resignation in order to accept the professorship of botany in the University of Texas tendered to him some months ago. This leaves vacant also the position of botanist to the Agricultural Experiment Station, which Professor Heald held at the time of his resignation. It is probable that in electing a successor the regents will continue the present arrangement which combines the professorship of botany in the School of Agriculture with the position of botanist to the Experiment Station. This involves also some instruction of advanced university students in plant pathology. The election will probably not be made before the middle of June.

Walter H. French, deputy-superintendent of public schools at Michigan, has been appointed professor in the Michigan State Agricultural College, in charge of the department of agricultural education.

Robert H. C. Heck, of Lehigh University, has accepted the chair of mechanical engineering at Rutgers College.

Henry B. Drowne, at present an assistant engineer with the State Board of Public Roads, of Rhode Island, has been appointed instructor in civil engineering at Brown University.

Mr. H. F. Hart will retire from an instructorship in mathematics at Syracuse University at the end of the present academic year, in order to take charge of the department of mathematics in the Montclair, N. J. High School.